TECHNICAL MANUAL

MAINTENANCE INSTRUCTIONS

DEPOT

REAR COMPRESSOR DRIVE TURBINE

AIRCRAFT ENGINE
USAF MODEL
F100-PW-229

PRATT & WHITNEY
LARGE MILITARY ENGINES
UNITED TECHNOLOGIES CORPORATION
F33657-84-C-2014
F41608-94-D-0816

THIS PUBLICATION IS ONE OF A SET OF TWELVE MANUALS. THE COMPLETE SET CONSISTING OF T.O. 2J-F100-53-1 THROUGH T.O. 2J-F100-53-11 AND T.O. 2J-F100-11-2 IS REQUIRED FOR DEPOT MAINTENANCE.

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RECORD OF CHANGES

Original	15 Aug 91	Change 14	15 Nov 95
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Change 2	15 Feb 92	Change 16	15 May 96
Change 3	15 May 92	Change 17	15 Nov 96
Change 4	15 Nov 92	Change 18	15 Feb 97
Change 5	15 Aug 93	Change 19	15 May 97
Change 6	15 Nov 93	Change 20	15 Aug 97
Change 7	15 Feb 94	Change 21	15 Nov 97
Change 8	15 May 94	Change 22	15 Feb 98
Change 9	15 Aug 94	Change 23	15 Aug 98
Change 10	15 Nov 94	Change 24	15 Nov 98
Change 11	15 Feb 95	Change 25	15 Feb 99
Change 12	15 May 95	Change 26	15 May 99
Change 13	15 Aug 95	Change 27	15 Aug 99

TOTAL NUMBER OF PAGES IN THIS MANUAL IS 550

LIST OF EFFECTIVE FRONT MATTER PAGES

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
Title	27	a	25
A - B	27	b Blank	0
C Blank	0	S-1 - S-4	11
VS-1 Deleted	19	S-5	14
VS-2 Blank Deleted	19	S-6	11

NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES

NOTE

Only those work packages assigned to this manual are listed in this index.

Insert Change No. 27 work packages and subordinate work packages, dated 15 Aug 1999. Dispose of superseded work packages and subordinate work packages. If changed pages are issued to a work package or subordinate work package, insert the changed pages in the applicable work package or subordinate work package. The portion of the text affected in a changed or revised Work package (WP) is indicated by change bars in the outer margin of each column of text. Changes to illustrations are indicated by pointing hands or change bars, as applicable.

NUMERICAL INDEX OF EFFECTIVE WORK PACKAGES (continued)

*Zero in this Column Indicates an Original WP/SWP

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229-541	28 SEP 98	O/I	Modification of PWA 55760 Fixture for Improved Part Retention, F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 92QC109)
2J-F100229-585	30 SEP 98	O/I	Modify PWA 57765 HPT Assembly/ Disassembly Stand by Reoperating PWA 57504-1 Crimper, F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 96QC127)
2J-F100229(II)-550	15 MAY 98	D	Final Assembly of Core Module Featuring ’97 Enhancement Package, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA053)
2J-F100229(VI)-507	27 FEB 95	O/I	Remove and Replace First Turbine Duct and Support Set to Provide Increased Cooling and Higher Margin Material First Duct Segments For F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 94QA197)
2J-F100229(VI)-508	15 MAY 95	D	Reoperation of F100-PW-229 High Pressure Turbine Container PN P4070548 (ECP 90QA009)
2J-F100229(VI)-517	15 SEP 97	D	Reoperation of PN 4069901 or PN 4080301 First Stage Turbine Disk to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA053)
2J-F100229(VI)-518	30 JUN 97	D	Reoperation of PN 4069949 and PN 4080429 First Stage Turbine Air Seal to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/ F-16 Aircraft. (ECP 96QA053)

SAFETY SUMMARY

INTRODUCTION

This Technical Order (T.O.) describes physical and chemical processes which may require the use of chemicals, solvents, paints, or other commercially available hazardous material. This T.O. also describes maintenance actions which may require handling or use of potentially dangerous parts or equipment.

Personnel performing maintenance procedures and practices included in this T.O. shall be familiar with safety precautions and procedures associated with chemicals and other hazardous materials, parts and equipment. The user of this T.O. shall consult their local safety and health staff and Material Safety Data Sheet (MSDS) concerning any questions on hazardous chemicals, personal protective equipment requirements, and appropriate handling and emergency procedures. The user shall become completely familiar with the manufacturer/supplier information and adhere to the procedures, recommendations, warnings, and cautions of the manufacturer/supplier for the safe use, handling, storage, and disposal of these materials. Disregarding safety precautions and procedures or performing unauthorized maintenance can cause engine or equipment damage, serious injury, illness, or death.

BACKUP WRENCH

When torquing or breaking torque on any tube coupling nut, use a suitable wrench to apply torque to the fitting to which the part is attached. Failure to properly use a backup wrench can result in failure of tubes and accessories due to stress loading during torquing procedures.

BEARING HANDLING

The most common cause of bearing damage is attributed to improper preservation and mishandling. Do not handle bearings with bare hands. Wear approved gloves when handling bearings. Coat bearings with engine oil and store in labeled containers as matched sets. Ensure all bearing components have matching serial numbers before installation to prevent bearing failure due to mismatched contact surfaces.

BRAZING, SOLDERING AND WELDING

Brazing, soldering and welding operations may produce fumes that can be harmful to breathe. Arc welding emits ultraviolet light, which can burn the skin and eyes. Provide adequate ventilation. Wear protective clothing/equipment. Ensure gas bottles are properly secured.

CABLES, ELECTRICAL

Small radius bends or severe flexing of electrical cables can result in damage to conductors and/or outer braid.

SAFETY SUMMARY (continued)

CARBON SEALS AND SEAL SEATS

Carbon seals and carbon seal seats are easily damaged and shall be handled with care. Do not allow carbon seals to come in contact with petroleum based solvents. These solvents will reduce the lubricity of the carbons and result in rapid seal wear. Do not handle carbon seals or seal seats with bare hands. Wear approved, lint free gloves.

CHEMICAL COMPOUNDS AND SOLUTIONS

Many of the chemical compounds and solutions used in cleaning, inspection, and repair may cause irritation to the skin, eyes, and respiratory system. Many of the chemicals, including their vapors, may be poisonous, easily ignited, corrosive, and react violently with incompatible materials. Improper mixing and combining of these chemicals may produce violent reactions, rapid heat generation, and explosive/toxic gases. Heating certain chemicals may cause toxic gases to be produced. Observe manufacturer’s warning labels and Material Safety Data Sheet (MSDS) instructions for proper handling, storage, and disposal. Consult the local Safety Office for additional information.

COMPRESSED AIR

Compressed air can generate flying debris and can cause severe injury if air blast penetrates the skin or eyes. Reduce compressed air pressure for cleaning or drying to less than 30 psig. Use with effective chip guarding and personal protective equipment. Do not direct air blast toward other personnel.

COMPRESSED GASES

Many compressed gases are highly flammable/explosive and can cause suffocation at varied levels of concentration or exposure time. Some of the gases can freeze body tissue. Keep ignition sources away. Provide adequate ventilation. Wear protective clothing/equipment. Store in properly marked/labeled containers at approved locations. Do not use in confined areas which may create an explosive atmosphere. Refer to specific Material Safety Data Sheet (MSDS) for additional information.

DANGEROUS PRESSURE

Pressure system precautions apply to all equipment using gases and fluids at all ranges of pressure. To avoid injury, stand clear of tooling and parts being pressure tested when pressure is being applied. Proper tool installation, shielding and hose connections shall be ensured before applying pressure. Ensure all system components are compatible with pressures applied and pressure medium used. Pressure shall be applied slowly.

SAFETY SUMMARY (continued)

ELECTROSTATIC DISCHARGE (ESD)

Circuit card assemblies and their related components may be damaged by undetectable electrostatic discharge. Care shall be used during handling or repair of these items. Use electrostatic discharge precautionary standard operating procedures.

ENGINE AND ACCESSORIES - TEMPERATURE

Aircraft engines and accessories are extremely hot following operation. Allow sufficient time to cool or wear protective clothing/equipment when maintenance or inspection tasks are required following engine operation. Failure to comply may result in injury to personnel.

ENGINE AND CONTROLS PRESERVATION

Engines and engine controls shall be drained of all fuel and preserved before shipping. Failure to drain fuel can result in a fire hazard. Engine preservation replaces any fuel with oil, which acts as a corrosion preventing agent.

FOREIGN OBJECT DAMAGE (FOD)

Foreign objects can enter engine compartments and accessories during maintenance. Always be aware of the potential for foreign object damage (FOD) entering any uncovered opening of an engine or accessory. Always thoroughly clean parts and compartments to remove all foreign material. Make a final detail inspection of the work area when the job is finished. Follow standard operating procedures for tool and equipment accountability.

FOOD AND TOBACCO

Wash hands and face thoroughly prior to smoking tobacco products or eating food. Residue of the materials used in engine and equipment maintenance can cause serious health problems if ingested or inhaled in the smoke.

HEARING PROTECTION

The frequency and intensity of noise generated during some operations may cause an acute or chronic hearing impairment. Wear approved hearing protection equipment. Contact the local safety office or bioenvironmental engineering for further guidance.

SAFETY SUMMARY (continued)

HYDRAULIC TOOLING

Application of hydraulic pressure to tooling or engine parts can cause them to jump with enough force to cause personal injury. Excessive pressure applied to tooling by a hydraulic pump can cause a structural failure to the engine part and/or the tooling which could result in personal injury. Using a ram with a nonapproved part number or exceeding hydraulic pump pressure can result in excessive pressure being applied to tooling. Do not exceed ram capacity for a given tool. Stand clear of tooling and engine parts during hydraulic tool operations.

JEWELRY

Remove rings, watches, necklaces, and other metallic objects that may be snagged or cause shock or burn hazards.

LEAD SEALS

Lead seals shall only be removed when specifically called for in the procedure. Lead seals identify areas of critical adjustment that can only be attained at the Depot or Vendor level.

LIFTING, ROTATING, AND SUPPORTING

Personnel shall stay clear of objects being lifted during hoist operations or when objects are supported by temporary transition supports. To prevent personal injury, use adequate number of personnel and appropriately rated lifting/handling devices to lift or move objects. Unless specified in the procedures, personnel shall not work on objects suspended by a hoist or supported by temporary transition supports. Personnel shall be prepared for potential unbalanced conditions during hoist operations.

LIVE ELECTRICAL CIRCUITS

Do not work on electrical systems, replace components, or make adjustments to equipment with the electrical supply turned on. Under certain conditions, danger may exist even when the power control is in the ‘‘off’’ position due to charges retained by capacitors. To avoid injuries, always remove power from, discharge, and ground a circuit prior to servicing. Adhere to all lock-out/tag-out requirements.

MAINTENANCE STANDS AND FIXTURES

Ensure modules or assemblies are firmly secured to work stands or fixtures before performing maintenance procedures. Personal injury or damage to modules or assemblies may occur if a work stand or fixture slips.

SAFETY SUMMARY (continued)

METAL MACHINING PROCESSES

Metal machining processes may generate dust, fumes, filings, and/or shavings which may cause acute/chronic irritation to the skin, eyes, digestive tract, and respiratory system. Metallic dust vapors may form a fire hazard when exposed to heat, flame, or when in contact with oxidizing agents. Prior to performing any metal machining process, personnel shall consult their local safety and health staff and the Material Safety Data Sheet (MSDS) to become familiar with the hazards and protective measures for a specific metal.

MOVING ENGINE

Do not move an engine on work stand rails or transportation trailer without having installed proper supports, tie-rods, and flange adapters. Engine may shift or fall off rails and cause injury to personnel. When moving engine, do not push on engine. Use the engine support mount assemblies as a push point.

PACKING LUBRICATION (OIL AND FUEL SYSTEMS)

Use only the lubricant specified in the technical order to lubricate fuel and oil system packings. Use of an incompatible lubricant can cause oil foaming, clogging of critical fuel system filters, and packing deterioration leading to leakage, possible fire and engine shutdown.

PROTECTIVE CLOSURES AND COVERS

Install protective closures on all plumbing and components immediately upon removal. Install protective covers on engine modules, assemblies, parts, and compartments when not being worked.

QUICK RELEASE PINS

Do not force quick release pins into place as this may damage the self-locking feature of the pins. The compatibility of quick release pins is determined by the part number. Intermixing of pin part numbers during installation can result in loss of or failure of the quick release pins.

SHARP EDGED BLADES

Many blades have sharp edges. Wear protective gloves when handling bladed rotors and when installing or removing blades from rotors. Blades should only be used in their designed holder or rotor.

SAFETY SUMMARY (continued)

SUPER-CHILLED/HEATED PARTS AND EQUIPMENT

Super-chilled or heated parts and the equipment or agents used to heat or chill can cause burns, frostbite, or both. Wear temperature resistant gloves and other related protective clothing/equipment when handling chilled or heated parts or equipment. Super-chilled parts are fragile due to a lower resistance to impact. Heating parts beyond specified temperature limits can degrade heat treat qualities and result in part failure.

TEMPERATURE NORMALIZING

Allow heated or chilled parts to reach room temperature before applying final torque to fasteners. Failure to comply may result in improperly seated parts and/or mistorqued fasteners.

WORK BOLTS AND WORK NUTS

Work bolts and work nuts shall be permanently marked to distinguish them from engine bolts and nuts. Do not apply lubricants to work bolts and work nuts that will be replaced by engine bolts and nuts which require a thread sealant. Sealants will not adhere to threads contaminated with lubricants.

WORK PACKAGE

ALPHABETICAL INDEX

REAR COMPRESSOR DRIVE TURBINE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	23	3 - 4	23	5	0
2	15			6 Blank	0

ALPHABETICAL INDEX

ALPHABETICAL INDEX (continued)

ALPHABETICAL INDEX (continued)

ALPHABETICAL INDEX (continued)

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	20	4 - 5	15	7	0
3	6	6 Blank	0	8 Blank	0

1. INTRODUCTION.

a. This technical order contains depot maintenance instructions for the Rear Compressor Drive Turbine.

2. CONTENTS, ARRANGEMENT, AND NUMBERING OF WORK PACKAGES.

a. This technical order contains work packages (WP) arranged in functional groups. A block of five digit numbers has been reserved for each group.

b. The first WP in each functional group is the introductory work package. The introductory work package provides a listing of all the work packages within that group by title and number.

WP Block Numbers	Functional Group
001 00	Alphabetical Index
002 00	Introduction
003 00 through 005 00	Module Removal/ Installation in Shipping Container
006 00 through 009 00	Open
010 00 through 019 00	Module Dismantling
020 00 through 199 00	Disassembly of Subassemblies
200 00 through 299 00	Cleaning
300 00 through 399 00	Inspection
400 00 through 499 00	Repair
500 00 through 599 00	Open
600 00 through 699 00	Assembly of Subassemblies
700 00 through 799 00	Final Assembly
800 00 through 899 00	Table of Limits

2A. CHANGE REQUEST.

a. Recommendations for specific changes to this technical order shall be submitted on an AFTO Form 22 to SA-ALC/LPCQ (TOMA), Kelly AFB, TX 78241-6421 in accordance with T.O. 00-5-1.

3. PICTORIAL INDEX.

(See FO-1 and Table 1.)

a. The pictorial index is used to identify each work package and associated part requiring depot maintenance.

4. LEADING PARTICULARS.

a. The following is a list of leading particulars for the Rear Compressor Drive Turbine.

REAR COMPRESSOR DRIVE TURBINE

Diameter:	26.15 inches
Length:	7.7 inches
Weight:	212 pounds (dry weight)

5. TYPICAL PART NUMBER.

a. When the word typical precedes a part number, that part number is one of several that may be used in that location. By referring to typical part number in the Illustrated Parts Breakdown (T.O. 2J-F100-54), all applicable part numbers can be found.

b. Instructions in this technical order for a typical part number also apply to the other (superseding) part numbers. When a part number is used without the word typical, it means that the procedure applies only to that part number.

6. LOCALLY MANUFACTURED SUPPORT EQUIPMENT.

a. Locally manufactured support equipment may be manufactured by the using activity or by a supplier.

b. Locally manufactured support equipment is listed in the Master Numerical List of Support Equipment in T.O. 2J-F100-53-3, and the Applicable Support Equipment and Illustrated Support Equipment sections of maintenance WPs/SWPs.

c. Locally manufactured support equipment is identified in these WPs/SWPs by the prefix LM and a four digit number (LM 0123), or by the prefix LM followed by the PWA number (LM PWA 51203).

d. When an LM tool is identified in a maintenance WP/SWP, all data required to make the tool will be found in T.O. 2J-F100-53-3, WP 050 00.

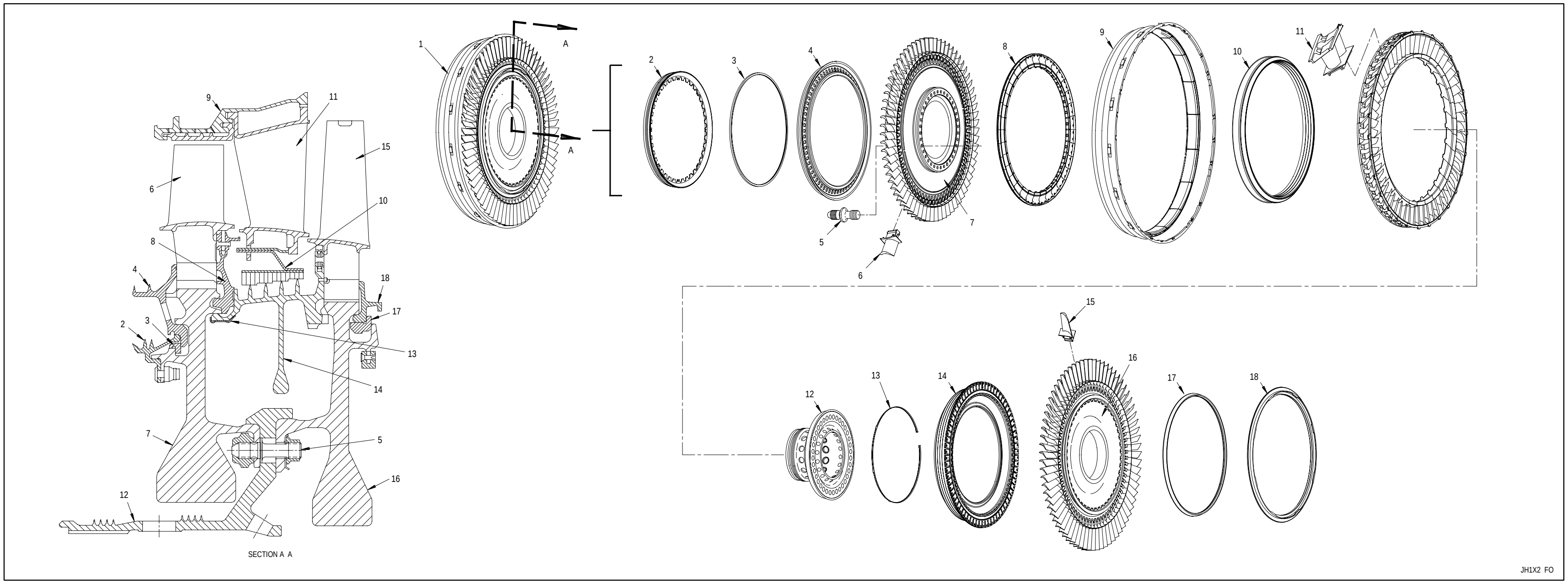
Table 1. Rear Compressor Drive Turbine - Pictorial Index (See FO-1.)

INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
1	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY	-	-	-	-	-	-	-	702 00 (*a)
2	SEAL, AIR, TURBINE FIRST STAGE	011 00	-	201 00	301 00	-	-	701 00	-
3	SPACER, TURBINE AIR SEAL	011 00	-	201 00	316 00	-	-	701 00	-
4	PLATE, RETAINING, BLADE, TURBINE FRONT, FIRST STAGE	011 00	-	201 00	302 00	-	-	701 00	-
5	TIEROD, TURBINE	011 00	-	201 00	313 00	-	-	701 00	-
6	BLADE, TURBINE ROTOR, FIRST STAGE	011 00	-	201 00	303 00	-	-	701 00	022 00 (*b) 318 00 (*c) 320 00 (*d)
7	DISK, TURBINE, FIRST STAGE	011 00	-	201 00	304 00	404 00	-	701 00	023 00 (*e)
8	PLATE ASSEMBLY, RETAINING, BLADE, TURBINE, REAR, FIRST STAGE	011 00	-	201 00	305 00	-	-	701 00	022 00 (*b)
9	DUCT AND SUPPORT SET, TURBINE, FIRST STAGE	011 00	021 00	201 00	306 00	406 00	601 00	701 00	-
10	RING ASSEMBLY, AIR SEALING, TURBINE, SECOND STAGE	011 00	021 00	201 00	307 00	-	601 00	701 00	-
11	VANE, TURBINE STATOR, SECOND STAGE	011 00	021 00	201 00	308 00	-	601 00	701 00	320 00 (*d) 319 00 (*f)
12	HUB ASSEMBLY, TURBINE, FRONT	011 00	-	201 00	314 00	414 00	-	701 00	-
13	DAMPER, TURBINE BLADE RETAINING PLATE	011 00	-	201 00	317 00	417 00	-	701 00	-
14	PLATE ASSEMBLY, RETAINING, BLADE, TURBINE, SECOND STAGE	011 00	-	201 00	309 00	409 00	-	701 00	023 00 (*e)
15	BLADE, TURBINE ROTOR, SECOND STAGE	011 00	-	201 00	310 00	-	-	701 00	022 00 (*b) 318 00 (*c) 320 00 (*d)

Table 1. Rear Compressor Drive Turbine - Pictorial Index (continued)

INDEX NO.	NAME	REM	DISASSY	CLEAN	INSP	REPAIR	ASSY	INSTL	OTHER
16	DISK, TURBINE, SECOND STAGE	011 00	-	201 00	311 00	-	-	701 00	023 00 (*e)
17	RING, TURBINE BLADE RETAINING PLATE	011 00	-	201 00	315 00	-	-	701 00	-
18	PLATE, RETAINING, BLADE TURBINE, REAR, SECOND STAGE	011 00	-	201 00	312 00	-	-	701 00	-

(*a)	702 00	DYNAMIC BALANCING
(*b)	022 00	SERVICE CYCLE MARKING
(*c)	318 00	FIRST AND SECOND STAGE TURBINE ROTOR BLADES MOMENT-WEIGHT CLASSIFICATION
(*d)	320 00	CLEANING AND INSPECTION
(*e)	023 00	NONDESTRUCTIVE INSPECTION CYCLE MARKING
(*f)	319 00	AIRFLOW CHECK



FO-1. Rear Compressor Drive Turbine - Pictorial Index

WORK PACKAGE

INTRODUCTION

SHIPPING CONTAINER, REAR COMPRESSOR DRIVE TURBINE -

REMOVAL/INSTALLATION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.

a. This work package introduces the 003 00 through 009 00 series of work packages for the rear compressor drive turbine rotor and stator assembly. The following work packages are included in this series:

WP No.	Title
004 00	Shipping Container, Metal, Rear Compressor Drive Turbine Rotor and Stator Assembly - Removal
005 00	Shipping Container, Metal, Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation
006 00 through 009 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

SHIPPING CONTAINER, METAL, REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY -

REMOVAL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23	4B Blank Added	21	7	19
3	20	5	21	8	12
4	21	6 - 6A	19	9	20
4A Added	21	6B	20	10 Blank	12

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF CORE MODULE FEATURING '97 ENHANCEMENT PACKAGE, F100-PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)
2J-F100229(VI)-508	15 MAY 95	D	REOPERATION OF F100-PW-229 HIGH PRESSURE TURBINE TURBINE CONTAINER PN 4070548 (ECP 90QA009)

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	REAR COMPRESSOR DRIVE TURBINE - REMOVAL FROM SHIPPING CONTAINER	
	FIXTURE, LIFT ------------------------	PWA 57920 OR
	ADAPTER ----------------------------	PWA 57712
	ADAPTER, LIFT AND TRUNNION ----------------	PWA 26147
	SLING, LIFTING ------------------------	PWA 56336
	STAND, HPT ASSEMBLY/DISASSEMBLY ------------	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY ------------	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY ------------	PWA 57503
	SAFETY HOOK -------------------------	PWA 2388

ILLUSTRATED SUPPORT EQUIPMENT

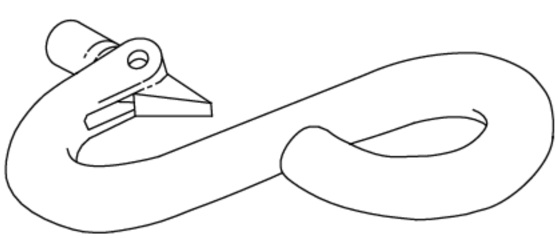

PWA 2388 –C

Figure T1. PWA 2388 SAFETY HOOK

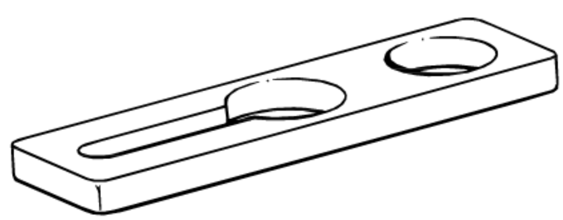
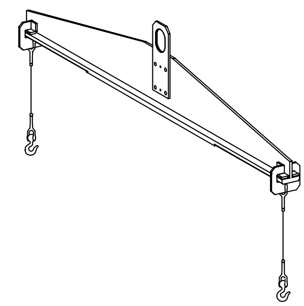

PWA 26147 –C

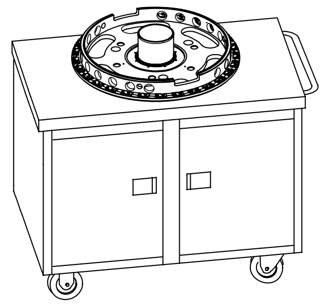
Figure T2. PWA 26147 ADAPTER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



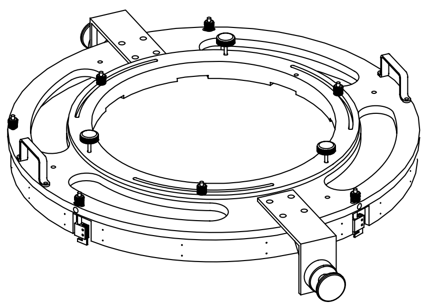
PWA 56336 –C

Figure T3. PWA 56336 SLING



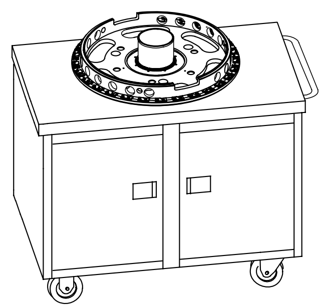
PWA 57503 –C

Figure T4. PWA 57503 STAND



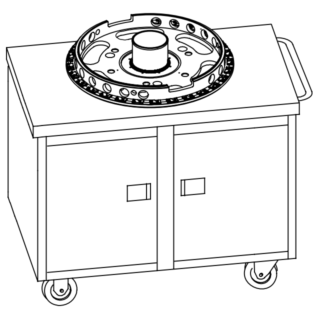
PWA 57712 –C

Figure T5. PWA 57712 ADAPTER



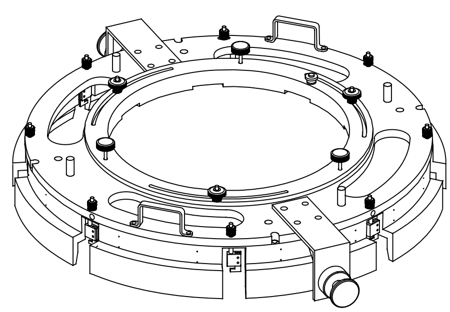
PWA 57765 –C

Figure T6. PWA 57765 STAND



PWA 57830 –C

Figure T7. PWA 57830 STAND



PWA 57920 –C

Figure T8. PWA 57920 FIXTURE

1. INTRODUCTION.

. This work package contains instructions for removal of rear compressor drive turbine from shipping container

2. REAR COMPRESSOR DRIVE TURBINE - REMOVAL FROM SHIPPING CONTAINER.

(See Figures 1, 1A, 2, 2A and 3.)

NOTE

Three shipping container configurations exist. When using shipping container PN P4070548 or PN 4070592, see figure 1. For shipping container PN P4078844, see figure 1A.

a. Release air pressure from container by pressing button on air pressure relief valve, see figure 1 or 1A.

b. Remove all records and papers.

NOTE

If cover is placed on floor, protect quick-disconnects and sealing surface of cover with blocks under cover flange.

c. Release quick-disconnects by turning 1/4 turn counterclockwise and remove container cover. If shipping container is PN P4078844, proceed to step g.

d. Loosen left and right strap assemblies over cover assembly.

e. Remove bolt assembly and lockwasher securing cover assembly.

f. Loosen velcro straps.

f1. Remove cover assembly. Proceed to step g1.

g. Remove hex nut, lockwasher, and flat washer securing cover. Remove cover, jamnut, lockwasher, flat washer, and plug securing rear compressor drive rotor and stator assembly. See figure 1A.

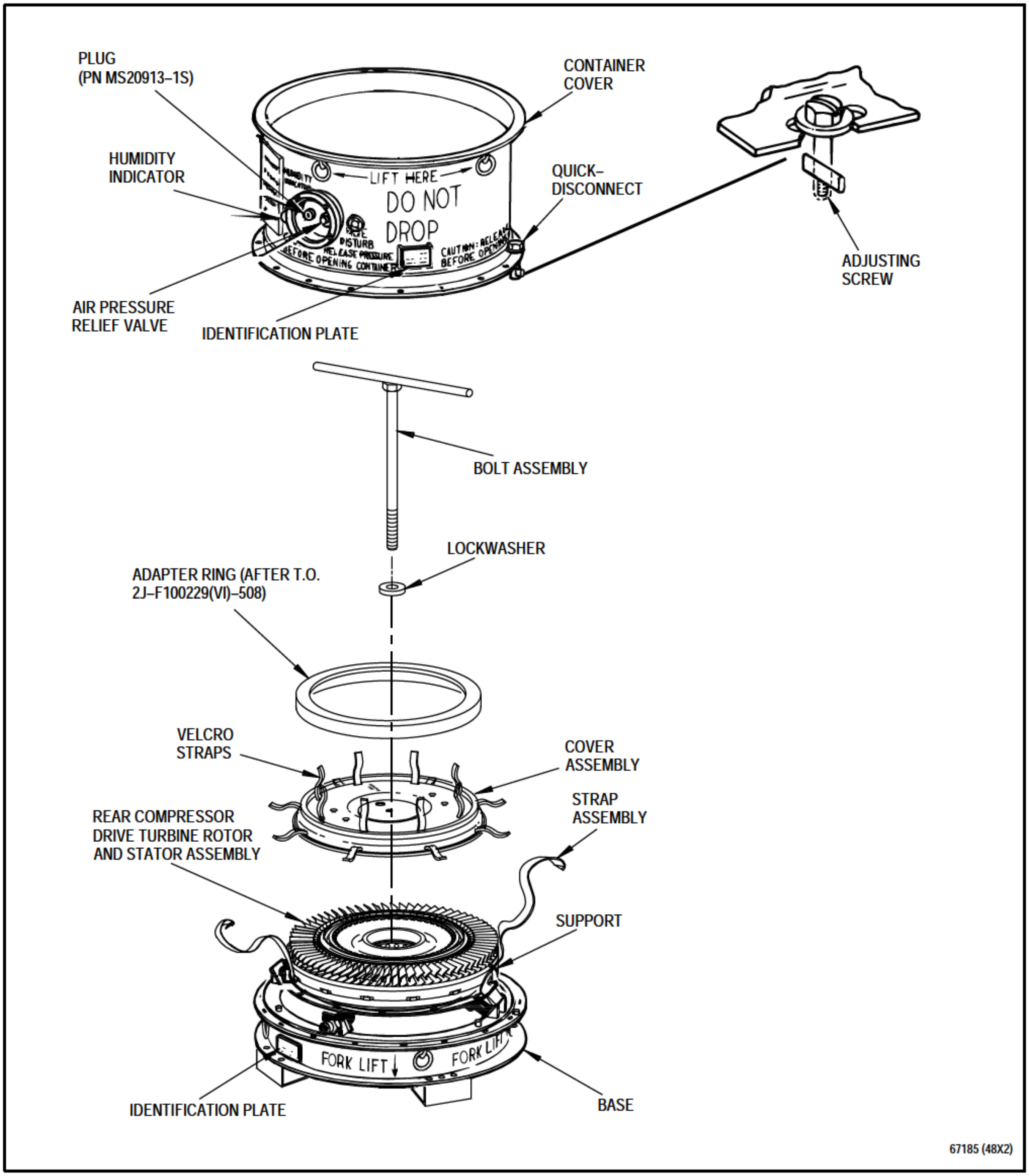


Figure 1. Rear Compressor Drive Turbine Rotor and Stator Assembly - Removal from PN P4070548 or PN P4070592 Shipping Container

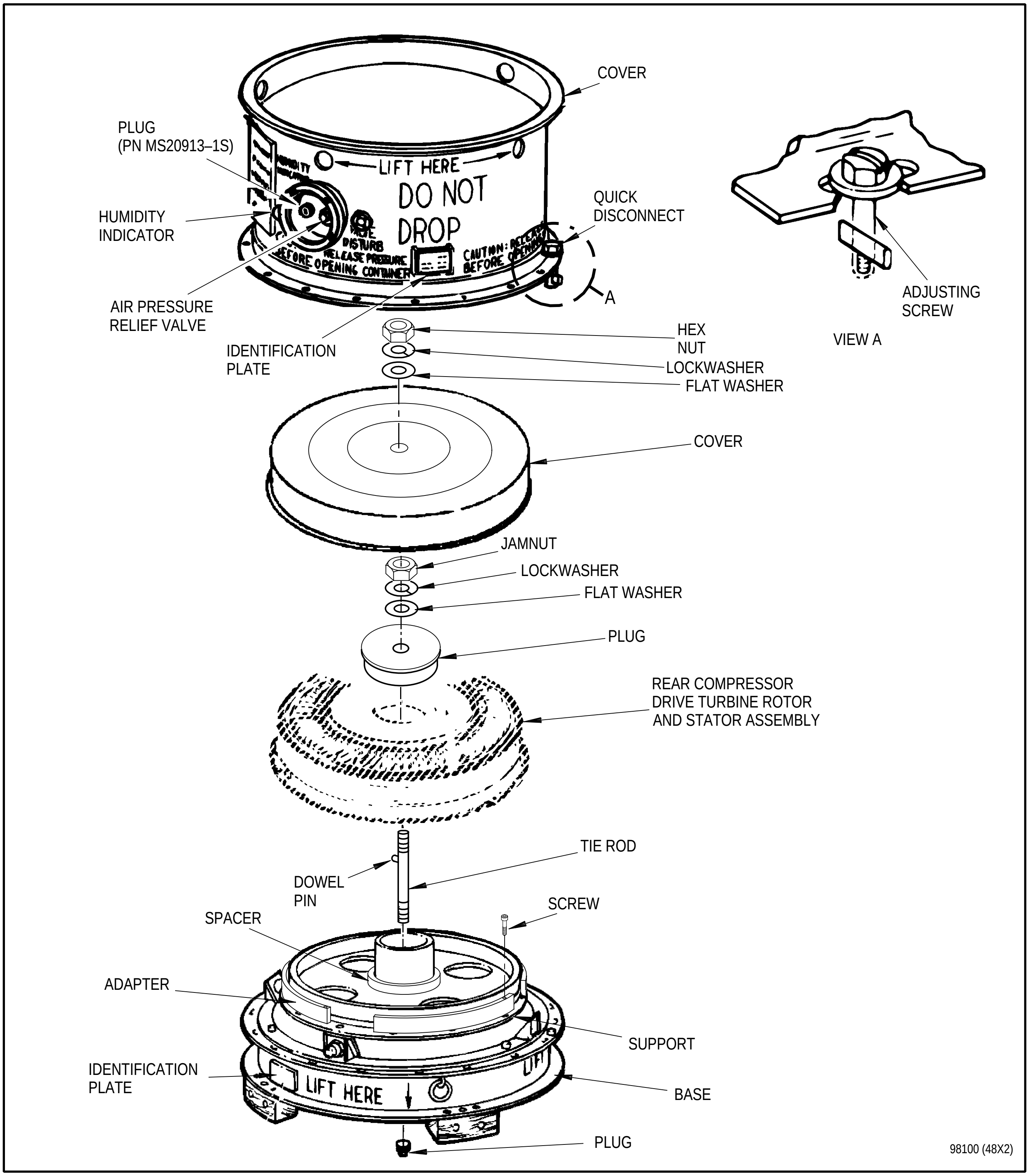


Figure 1A. Rear Compressor Drive Turbine Rotor and Stator Assembly - Removal from PN P4078844 Shipping Container

g1. Determine lift fixture to be used based on rear compressor drive turbine rotor and stator assembly configuration. For PN 4084517-700 assembly use PWA 57920 lift fixture (see step h.). For all other configurations use PWA 57712 adapter (see step i.).

h. Install PWA 57920 lift fixture onto rear compressor drive turbine rotor and stator assembly as follows:

(1) Loosen all knurled knobs(5, 6, and 7, figure 2).

(2) Remove ball lock pin(2).

(3) Rotate clamp ring(1) fully clockwise.

CAUTION

Failure to center lift fixture over turbine rotor and stator assembly during installation can result in damage to 2nd stage turbine blades.

NOTE

Twelve o'clock position of 1st stage turbine duct and support set is slot located between X marks on face of turbine duct and vane support rear flange.

(4) Install PWA 57920 fixture on rotor and stator assembly(8) with word TOP on base assembly(3) aligned with 12 o'clock position of rotor and stator assembly. Ensure ID of base assembly(3) does not contact 2nd stage turbine blades.

(5) Rotate clamp ring counterclockwise as necessary to prevent interference between lugs on clamp ring and lugs on second stage turbine blade retaining plate during installation.

WARNING

Failure to ensure proper installation of clamps may result in disengagement of PWA 57920 during lifting and cause serious injury to personnel.

(6) Engage eight clamps(4) into rectangular slots of turbine duct and vane support. Tighten knurled knobs(5) handtight.

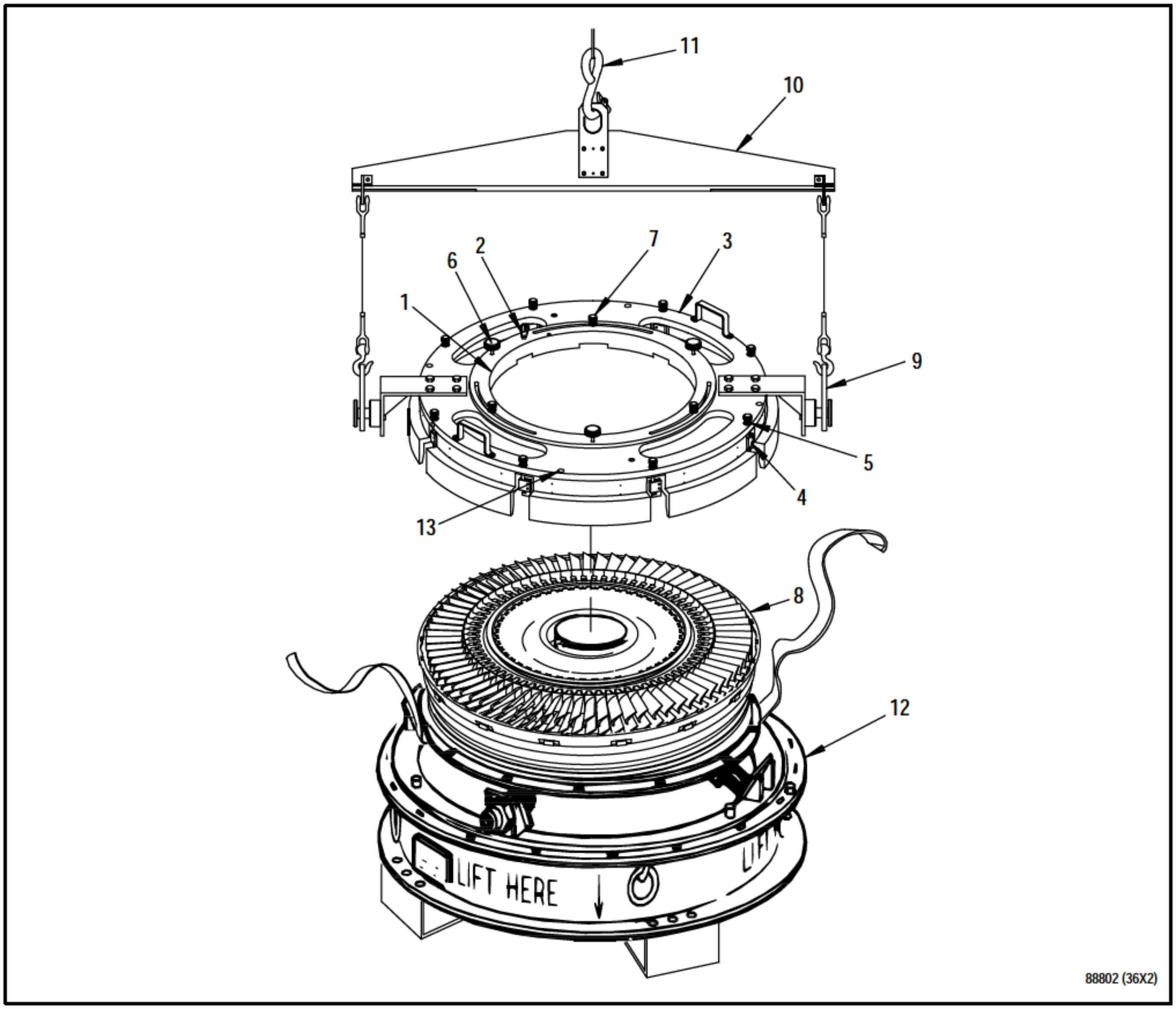
(7) Ensure all flush pins(13) are even with, or above adjacent surface of base assembly(3). If flush pins are below surface of base assembly repeat steps (1) through (6).

(8) Push clamp ring(1) down and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(9) Install ball lock pin(2) into clamp ring(1). Ring should not rotate far enough to allow disengagement of lugs on ring clamp. If disengagement of lugs occurs repeat steps(1) through (9).

(10) Tighten knurled head screws(6) handtight to hold running position of rotor.

(11) Tighten knurled knobs(7) securing clamp ring(1).



1. Clamp ring
2. Ball lock pin
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled head screw
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. Adapter
10. Sling
11. Safety hook
12. Shipping container base
13. Flush pin (4 places)

Figure 2. PWA 57920 Fixture - Installation

i. Install PWA 57712 adapter(3, figure 2A) onto rear compressor drive turbine rotor and stator assembly(8) as follows:

(1) Loosen all detail-14 knurled knobs(5, 6, and 7). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure lugs on ring clamp align with scallops in 2nd turbine blade rear retaining plate.
- The 12 o’clock position of 1st stage turbine duct and support set is slot located between x-marks on face of rear flange.

(2) Position adapter(3) on rotor and stator with the word TOP (marked on detail-1) at 12 o’clock.

(3) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o’clock positions, into slots in stator assembly.

(4) Tighten detail-14 knurled knobs(5) handtight.

(5) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(6) Install detail-20 spring plunger(2) into clamp(1). Clamp should not rotate. If clamp rotates repeat steps(5) and (6).

(7) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(8) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1.

NOTE

Unless specifically called out, PWA 57920 lift fixture and PWA 57712 adapter will be referred to as lift fixture.

j. Attach PWA 26147 adapters(9) and PWA 56336 sling(10) onto trunnions of lift fixture.

k. Install PWA 57830 detail-23 ring(6, figure 3) onto base of stand(5).

l. Using an overhead hoist with PWA 2388 safety hook(11, figure 2), lift rear compressor drive turbine rotor and stator assembly(8) from shipping container base(12). Lower assembly onto PWA 57830 stand(5, figure 3) rear face down. Align trunnions of lift fixture(2) with slots in base of PWA 57830 stand(5). Remove PWA 56336 sling(1) and PWA 26147 adapters(3).

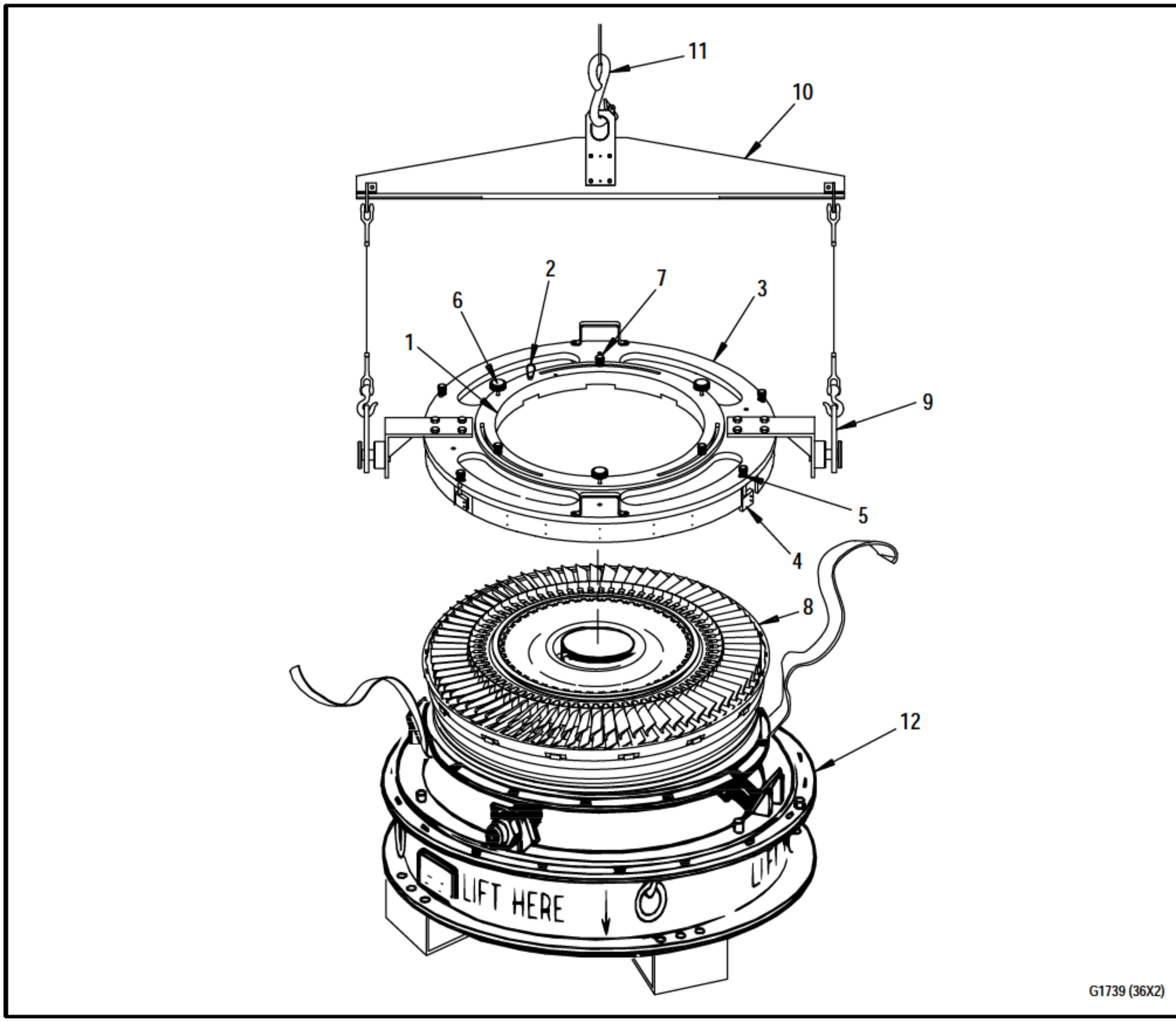
NOTE

There are two configurations of rear compressor drive turbine rotor and stator assembly shipping container. For shipping container (PN P4070548) not incorporating T.O. 2J-F100229(VI)-508, continue with step m. For shipping container (PN P4070592) incorporating T.O. 2J-F100229(VI)-508, proceed to step n.

m. For shipping container (PN P4070548) not incorporating T.O. 2J-F100229(VI)-508 proceed as follows: (See figure 1.)

(1) Replace cover assembly onto container support.

(2) Engage bolt assembly through cover assembly and into container support.



1. Ring clamp
2. Spring plunger
3. Adapter
4. Clamp
5. Knurled knob
6. Knurled knob
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. Adapter
10. Sling
11. Safety hook
12. Shipping container base

Figure 2A. PWA 57712 Adapter - Installation

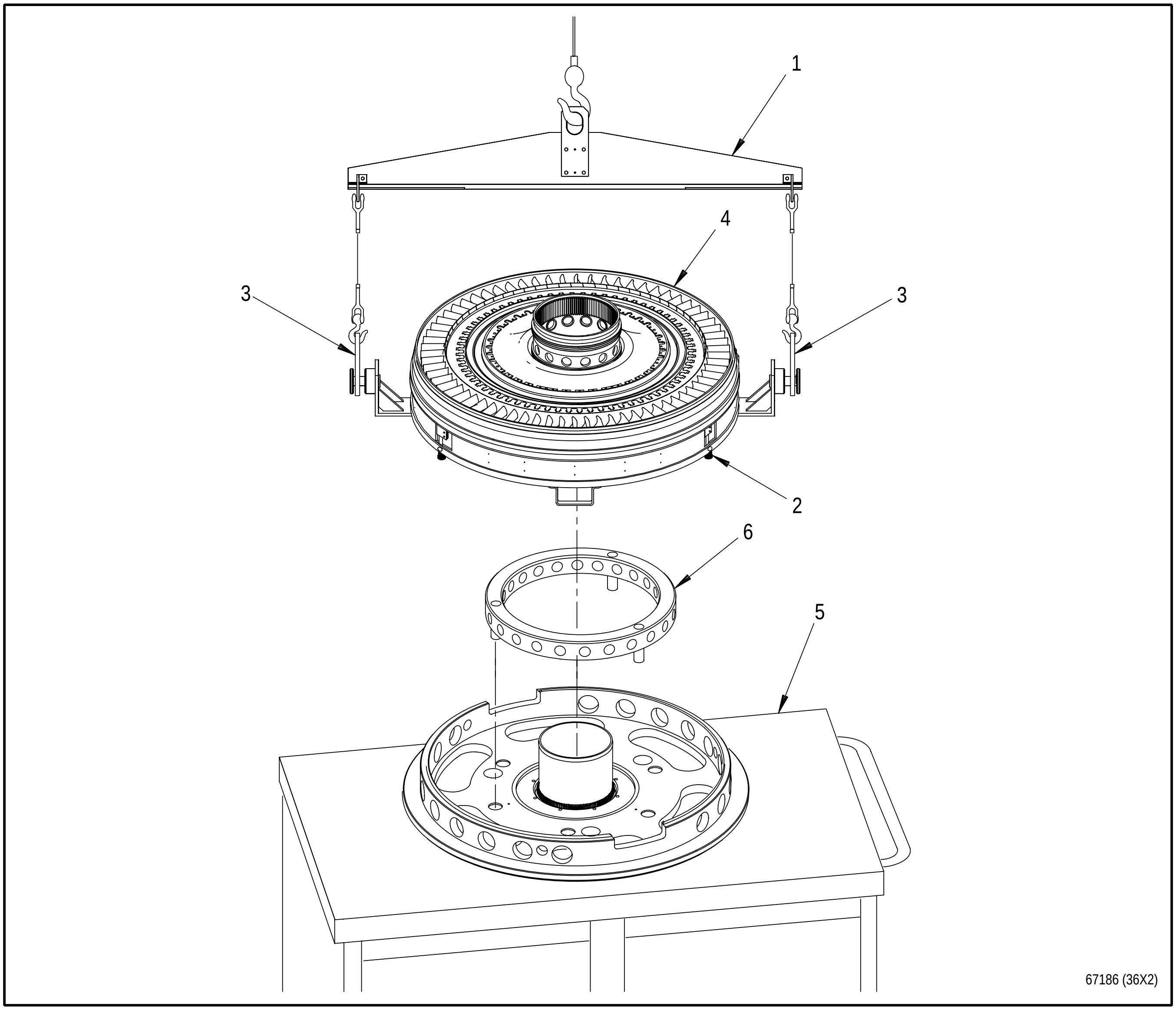
l. For shipping container (PN P4070592) incorporating T.O. 2J-F100229(VI)-508 proceed as follows: (See figure 1.)

(1) Remove adapter ring from container support.

(2) Position adapter ring face down on top of cover assembly and secure with velcro straps.

(3) Replace cover assembly onto container support.

(4) Engage bolt assembly through cover assembly and into container support.



1. PWA 56336 sling
2. Lift fixture
3. PWA 26147 adapters
4. Rear compressor drive turbine rotor and stator assembly
5. PWA 57830 stand
6. Ring

Figure 3. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation onto PWA 57830 Stand

WORK PACKAGE

TECHNICAL PROCEDURES

SHIPPING CONTAINER, METAL, REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY -

INSTALLATION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 18

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23	8 - 9	19	14A Added	21
3 - 4	20	10	20	14B Blank Added	21
5	21	11	19	15	21
6	19	12 - 14	21	16	19
7	20				

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T.O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 1998	D	FINAL ASSEMBLY OF CORE MODULE FEATURING ’97 ENHANCEMENT PACKAGE, F100-PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)
2J-F100229(VI)-508	15 MAY 1995	D	REOPERATION OF F100-PW-229 HIGH PRESSURE TURBINE CONTAINER PN P4070548 (ECP 90QA009)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Ethyl alcohol	O-E-760

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Consumable packaging parts - rear compressor drive turbine	P4078919	1
Desiccant (16 unit)	* P8320	1
Lockwire	* MS20995-C41 or MS9226-05	As Required
Seal, lead	* 83280	3
* Details of PN P4078919 Parts		
Indicator, humidity	P50844	1
Plate, identification	P52715	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION	
	SAFETY HOOK	PWA 2388
	FIXTURE, LIFT	PWA 57920 OR
	ADAPTER	PWA 57712
	ADAPTER, LIFT AND TRUNNION	PWA 26147
	SLING, LIFTING	PWA 56336
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503

ILLUSTRATED SUPPORT EQUIPMENT

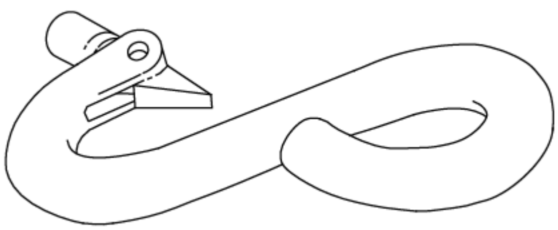

PWA 2388 –C

Figure T1. PWA 2388 SAFETY HOOK

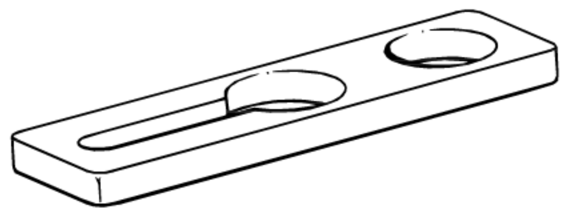

PWA 26147 –C

Figure T2. PWA 26147 ADAPTER

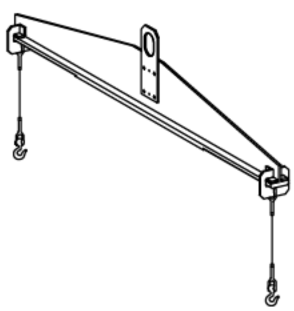

PWA 56336 –C

Figure T3. PWA 56336 SLING

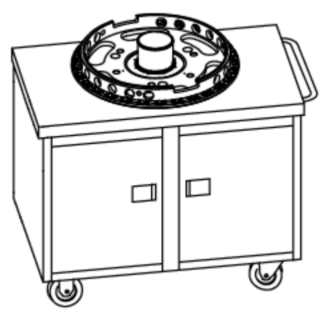

PWA 57503 –C

Figure T4. PWA 57503 STAND

ILLUSTRATED SUPPORT EQUIPMENT (continued)

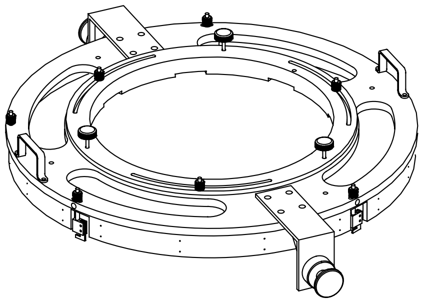


Figure T5. PWA 57712 ADAPTER

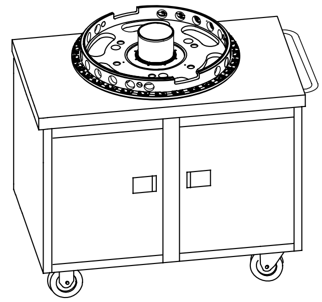


Figure T6. PWA 57765 STAND

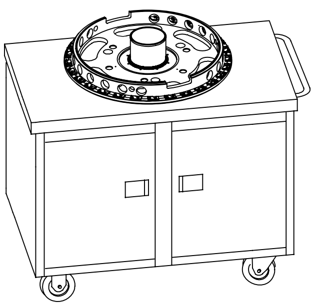


Figure T7. PWA 57830 STAND

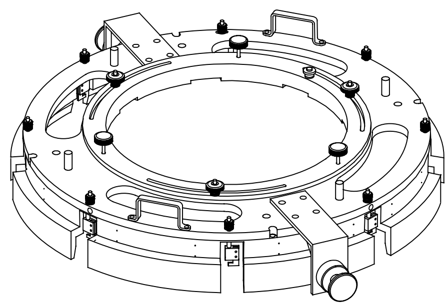


Figure T8. PWA 57920 FIXTURE

1. INTRODUCTION.

a. This work package contains instructions for installation of rear compressor drive turbine rotor and stator assembly into shipping container.

2. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION.

(See Figures 1 through 4.)

a. Disassemble, clean, and inspect shipping container as follows (see figure 3):

(1) Release all quick disconnects by turning 1/4 turn counterclockwise.

(2) Using sling and hoist, remove cover.

(3) Place several wood blocks on floor to support and protect flange sealing surface. Lower cover onto blocks.

(4) Check condition of container identification plates on container cover and base as shown in figure 3. If required, install new container identification plate per paragraph 3.

NOTE

Packaging items such as desiccant, lockwire, and lead seals, are available in PN P4078919 consumable packaging parts.

(5) Remove old desiccant.

(6) Clean interior.

(7) Check flange mating surfaces and preformed packing for conditions which could cause leakage. Correct, if necessary.

b. Determine lift fixture to be used based on rear compressor drive turbine rotor and stator assembly configuration. For PN 4084517-700 assembly use PWA 57920 lift fixture (see step c.). For all other configurations use PWA 57712 adapter (see step d.).

c. Install PWA 57920 lift fixture onto rear compressor drive turbine rotor and stator assembly as follows:

(1) Loosen all knurled knobs(5, 6, and 7, figure 1).

(2) Remove ball lock pin(2).

(3) Rotate clamp ring(1) fully clockwise.

CAUTION

Failure to center lift fixture over turbine rotor and stator assembly during installation can result in damage to 2nd stage turbine blades.

NOTE

Twelve o’clock position of 1st stage turbine duct and support set is slot located between X marks on face of turbine duct and vane support rear flange.

(4) Install PWA 57920 fixture on rotor and stator assembly(8) with word TOP on base assembly(3) aligned with 12 o’clock position of rotor and stator assembly. Ensure ID of base assembly(3) does not contact 2nd stage turbine blades.

(5) Rotate clamp ring counterclockwise as necessary to prevent interference between lugs on clamp ring and lugs on second stage turbine blade retaining plate during installation.

WARNING

Failure to ensure proper installation of clamps may result in disengagement of PWA 57920 during lifting and cause serious injury to personnel.

(6) Engage eight clamps(4) into rectangular slots of turbine duct and vane support. Tighten knurled knobs(5) handtight.

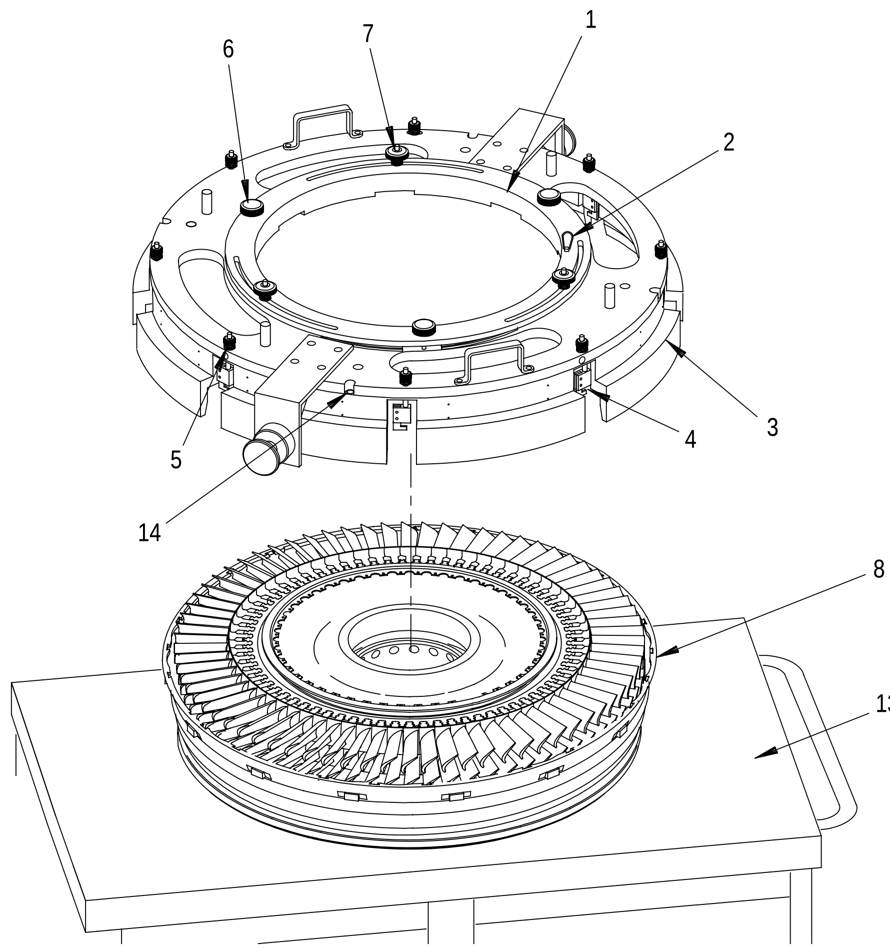
(7) Ensure all flush pins(14) are even with, or above adjacent surface of base assembly(3). If flush pins are below surface of base assembly repeat steps (1) through (6).

(8) Push clamp ring(1) down and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(9) Install ball lock pin(2) into clamp ring(1). Ring should not rotate far enough to allow disengagement of lugs on ring clamp. If disengagement of lugs occurs repeat steps(1) through (9).

(10) Tighten knurled head screws(6) handtight to hold running position of rotor.

(11) Tighten knurled knobs(7) securing clamp ring(1).



1. Clamp ring
2. Ball lock pin
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled head screw
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. Adapter
10. Sling
11. Safety hook
12. Base
13. PWA 57830 Stand
14. Flush pin (4 places)

Figure 1. PWA 57902 Fixture - Installation (Sheet 1 of 2)

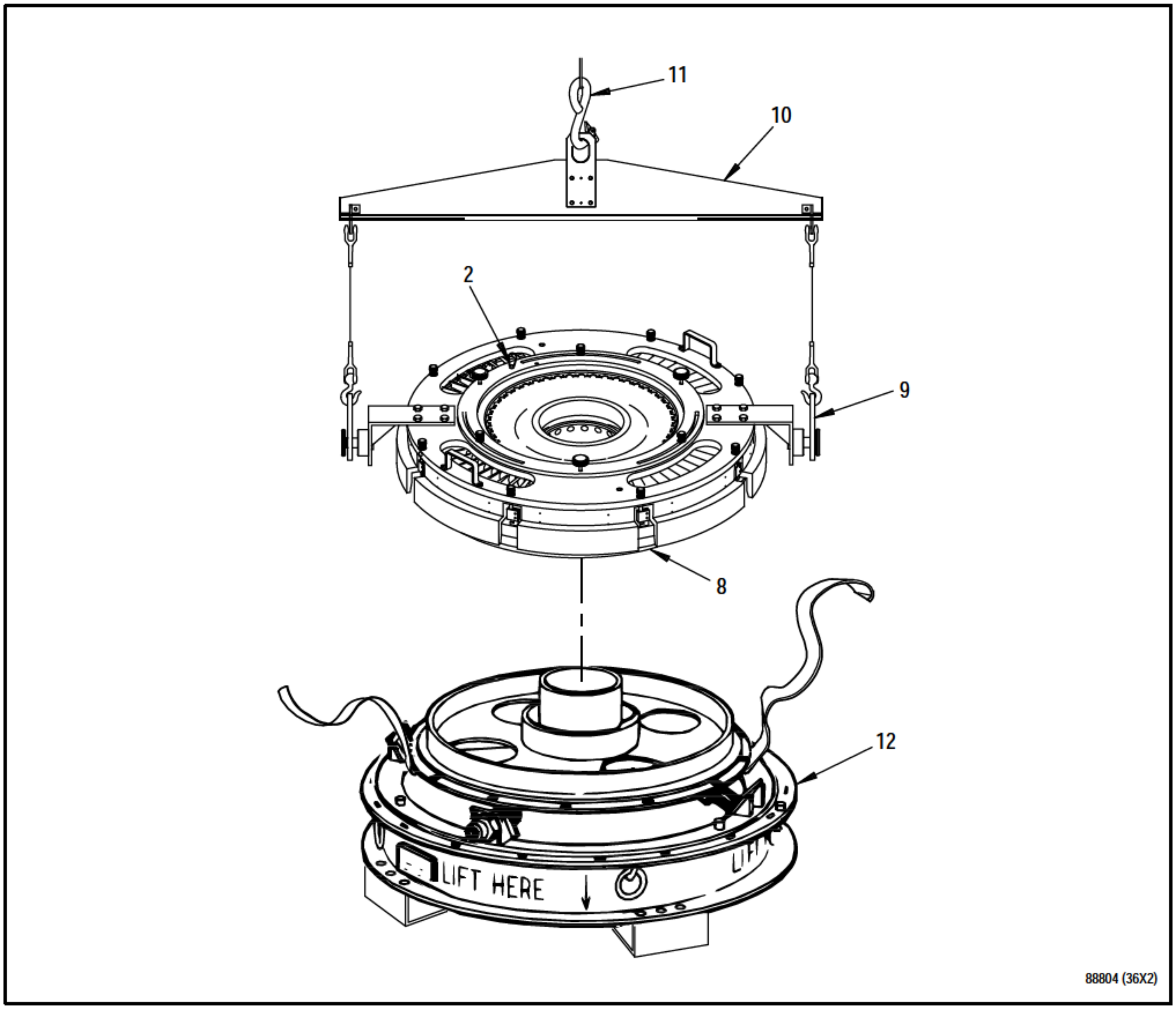


Figure 1. PWA 57902 Fixture - Installation (Sheet 2 of 2)

d. Install PWA 57712 adapter onto rear compressor drive turbine rotor and stator assembly(8, figure 2) as follows:

(1) Loosen all detail-14 knurled knobs(5, 6, and 7). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure lugs on ring clamp align with scallops in 2nd turbine blade rear retaining plate.
- The 12 o’clock position of 1st stage turbine duct and support set is the slot located between x-marks on face of rear flange.

(2) Position adapter on rotor and stator with the word TOP (marked on detail-1 base assembly) at 12 o’clock.

(3) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o’clock positions, into slots in stator assembly.

(4) Tighten detail-14 knurled knobs(5) handtight.

(5) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(6) Install detail-20 spring plunger(2) into ring clamp(1). Clamp should not rotate. If clamp rotates repeat steps(5) and (6).

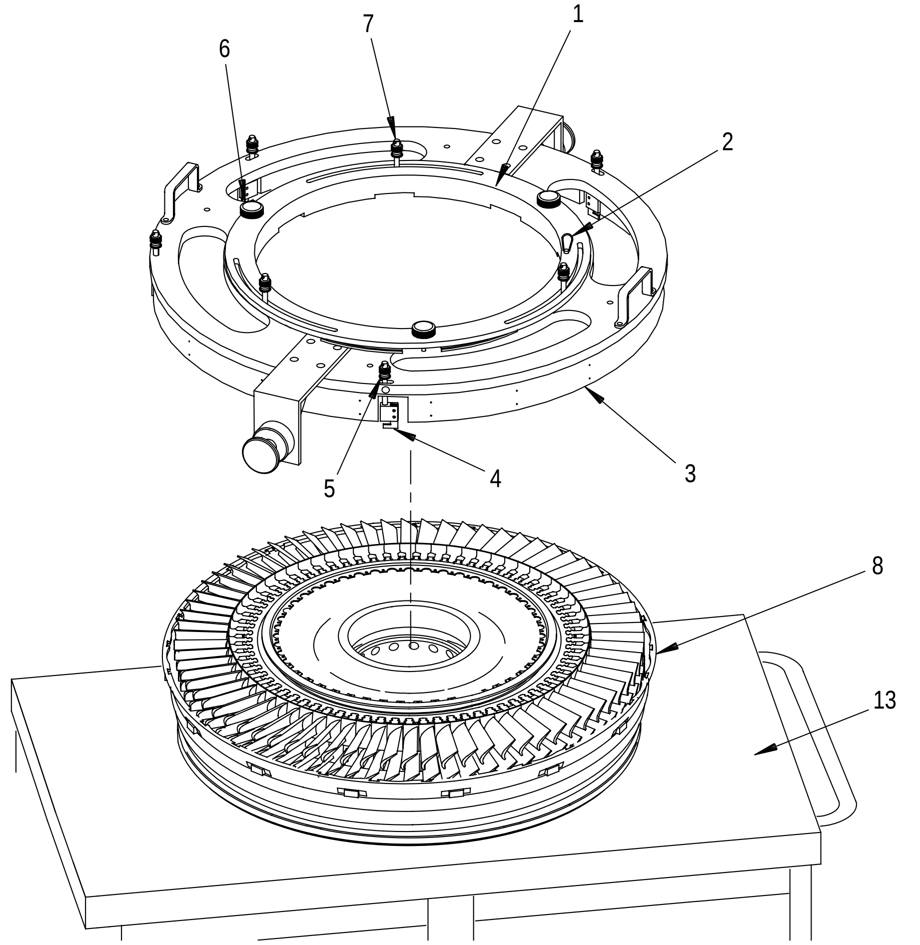
(7) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(8) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1 base.

NOTE

Unless specifically called out, PWA 57920 lift fixture and PWA 57712 adapter will be referred to as lift fixture.

e. Attach PWA 26147 adapters(9) and PWA 56336 sling(10) onto trunnions of lift fixture.



1. Ring clamp
2. Spring plunger
3. Adapter
4. Clamp
5. Knurled knob
6. Knurled knob
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. Adapter
10. Sling
11. Safety hook
12. Base
13. PWA 57830 Stand

Figure 2. PWA 57712 Adapter - Installation (Sheet 1 of 2)

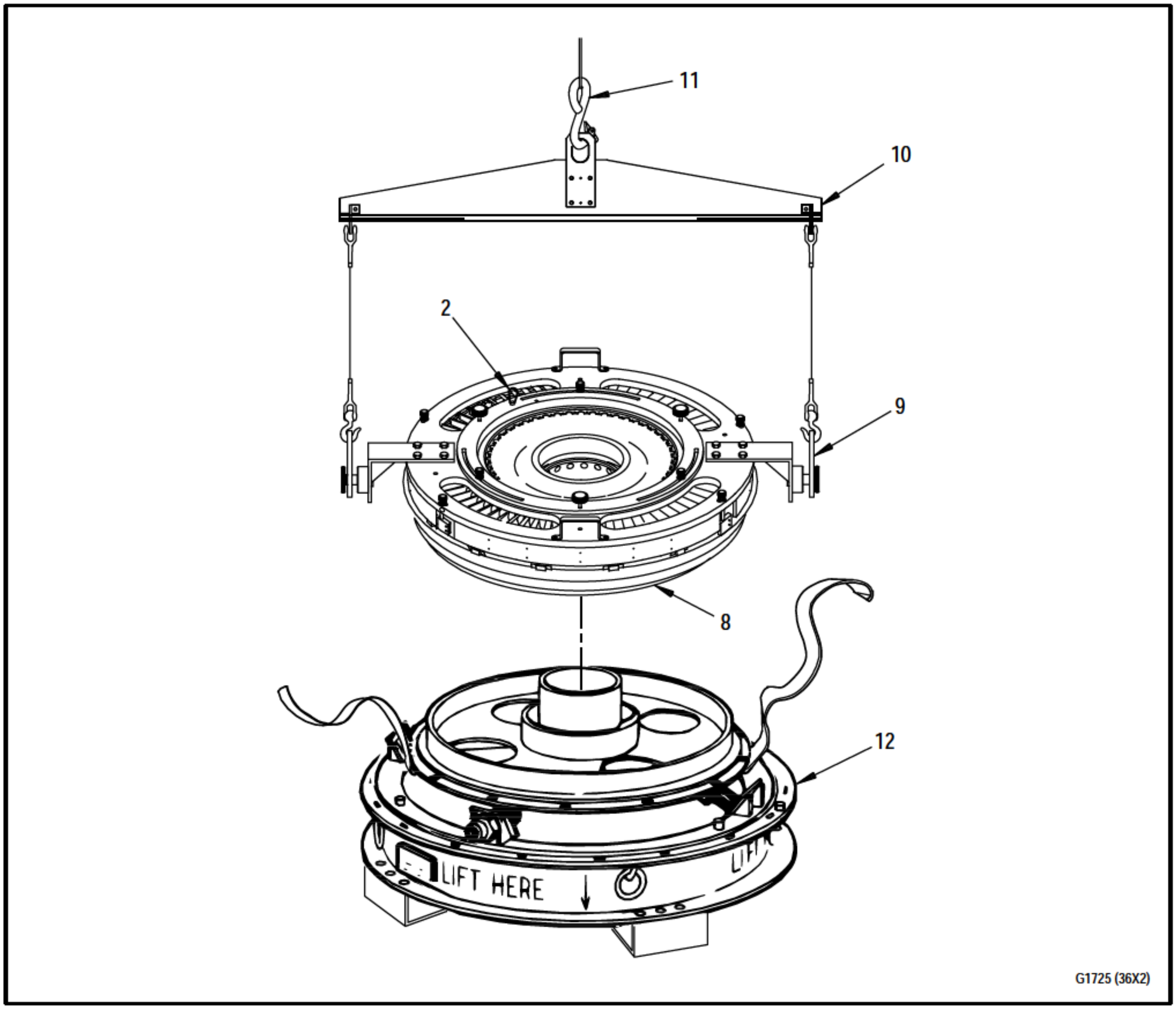


Figure 2. PWA 57712 Adapter - Installation (Sheet 2 of 2)

NOTE

There are three configurations of rear compressor drive turbine rotor and stator assembly shipping container. For shipping container (PN P4070548) not incorporating T.O. 2J-F100229(VI)-508, continue to step f. For shipping container (PN P4070592) incorporating T.O. 2J-F100229(VI)-508, proceed to step g. For shipping container PN P4078844, proceed to step h1.

f. For shipping container (PN P4070548) not incorporating T.O. 2J-F100229(VI)-508 proceed as follows (see figure 2):

(1) Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly(8) from PWA 57830 stand.

(2) Lower rear compressor drive turbine rotor and stator assembly onto container support.

(3) Remove lift fixture, PWA 56336 sling(10) and PWA 26147 adapters(9) from rear compressor drive turbine rotor and stator assembly.

g. For shipping container (PN P4070592) incorporating T.O. 2J-F100229(VI)-508 proceed as follows (see figure 1):

(1) Loosen velcro straps and remove adapter ring from cover assembly.

(2) Install adapter ring face up onto container lower support.

(3) Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly(8) from PWA 57830 stand.

(4) Lower rear compressor drive turbine rotor and stator assembly onto container support.

(5) Remove lift fixture with PWA 56336 sling(10) and PWA 26147 adapters(9) from rear compressor drive turbine rotor and stator assembly.

h. Install cover assembly as follows (see figure 3):

(1) Wipe inner surface of cover assembly with clean cloth.

(2) Center cover assembly over rear compressor drive turbine rotor and stator assembly.

(3) Lower cover assembly onto rear compressor drive turbine rotor and stator assembly.

(4) Ensure rubber grommet on cover assembly rests on both second stage vane package and on rotor and stator assembly duct support.

(5) Install bolt assembly through cover assembly and engage threads in container support.

(6) Tighten bolt assembly until lockwasher is compressed, turn bolt assembly an additional 1/4 turn.

(7) Inspect for proper seating of cover assembly against second stage disk viewed through inspection ports.

(8) Loop strap assemblies over cover assembly looping straps once around bolt assembly handle. Ensure bolt assembly can not back off.

(9) Secure strap assembly. Go to step i.

h1. For shipping container PN P4078844 proceed as follows (see figure 4):

(1) Ensure spacer and adapters are installed.

(2) Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly from PWA 57830 stand.

(3) Lower rear compressor drive turbine rotor and stator assembly onto container support.

(4) Remove lift fixture with PWA 56336 sling and PWA 26147 adapters from rear compressor drive turbine rotor and stator assembly.

(5) Install plug and secure with flat washer, lockwasher, and jamnut.

(6) Install cover and secure with flat washer, lockwasher, and hex nut.

i. Install one bag of PN P8320 desiccant into basket of container.

j. Attach condition tag to assembly.

k. Inspect container interior for cleanness and turbine for security.

l. Install cover and secure by turning quick-disconnects 1/4 turn clockwise.

m. Place all shipping paperwork in record receptacle. Seal record receptacle with PN MS20995-C41 or PN MS9226-05 lockwire and PN 83280 lead seal in two places.

n. Whenever container marking is required, identify module information on outside of container in one inch high block letters.

o. Perform container pneumatic pressure leak test as follows:

NOTE

These instructions are for leak testing metal containers only, fiberglass container shall be leak tested in accordance with T.O. 35E20-3-33-1.

(1) Remove container 1/8 NPT plug from desiccant access port cover. Introduce supply of air through hole. Test pressure shall be sufficient to overcome pressure relief valve setting.

(2) After relief valve opens, stop source of air pressure, allowing container pressure to drop and relief valve to close.

(3) Use soap solution to check container flange for leakage. If leakage exists, tighten adjusting screw at each turnlock fastener location where leaks have been identified. Use 3/16 hex key to torque a maximum of 100 pound-inches.

(4) Introduce air into container and check container flange for leaks. If leaks persist, repair container as required.

(5) Remove air supply line and install container 1/8 NPT plug.

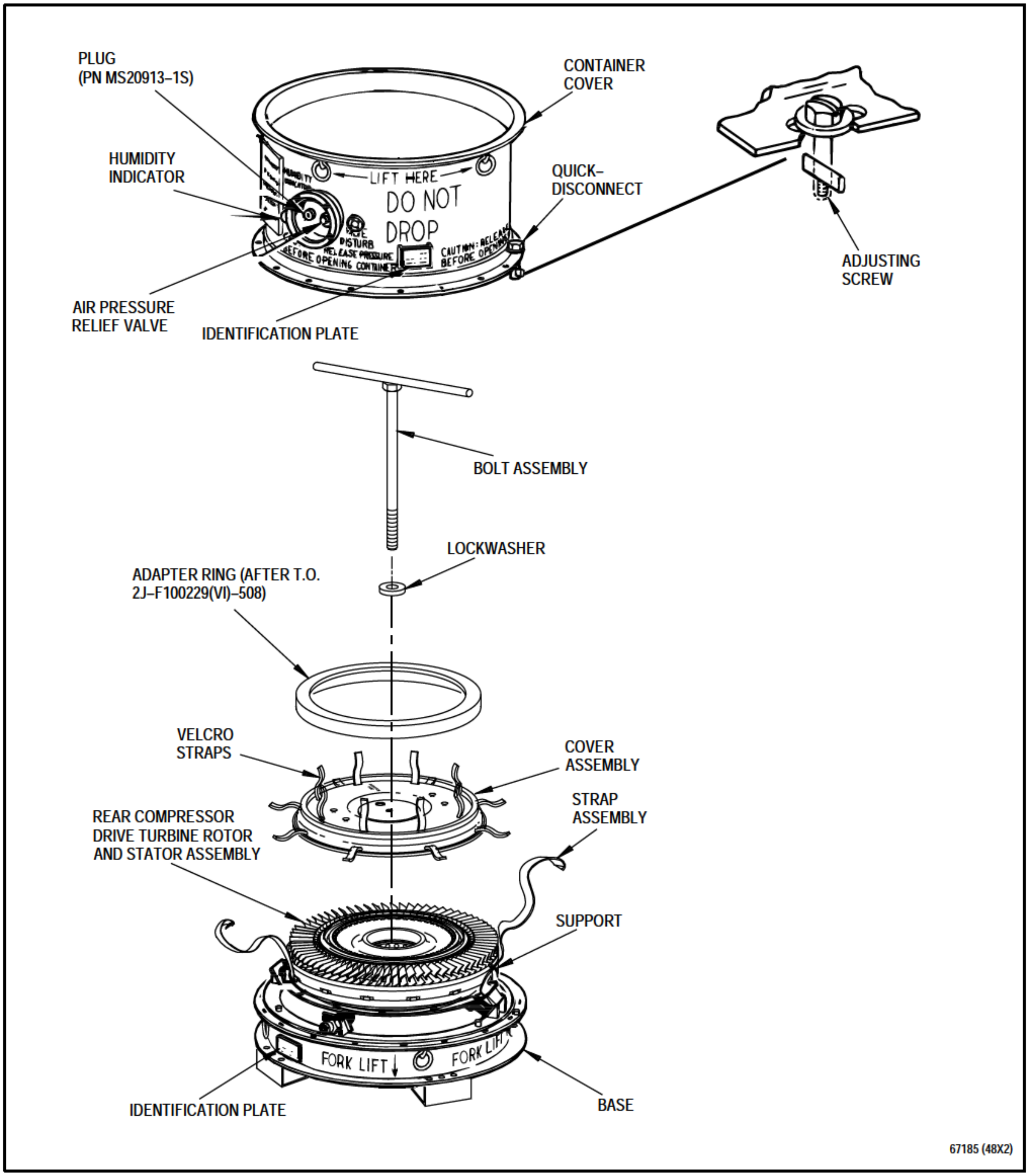


Figure 3. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation Into PN P4070548 or PN P4070592 Shipping Container (Sheet 1 of 2)

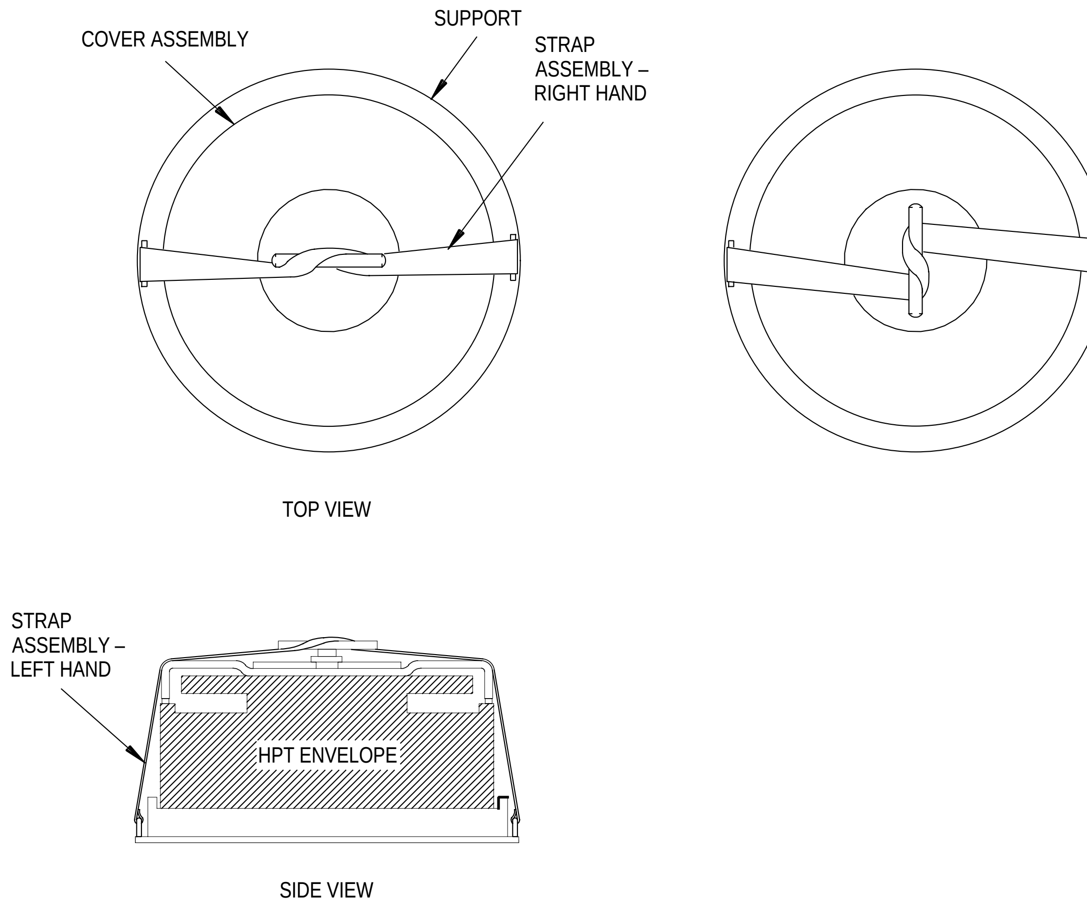


Figure 3. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation Into PN P4070548 or PN P4070592 Shipping Container (Sheet 2 of 2)

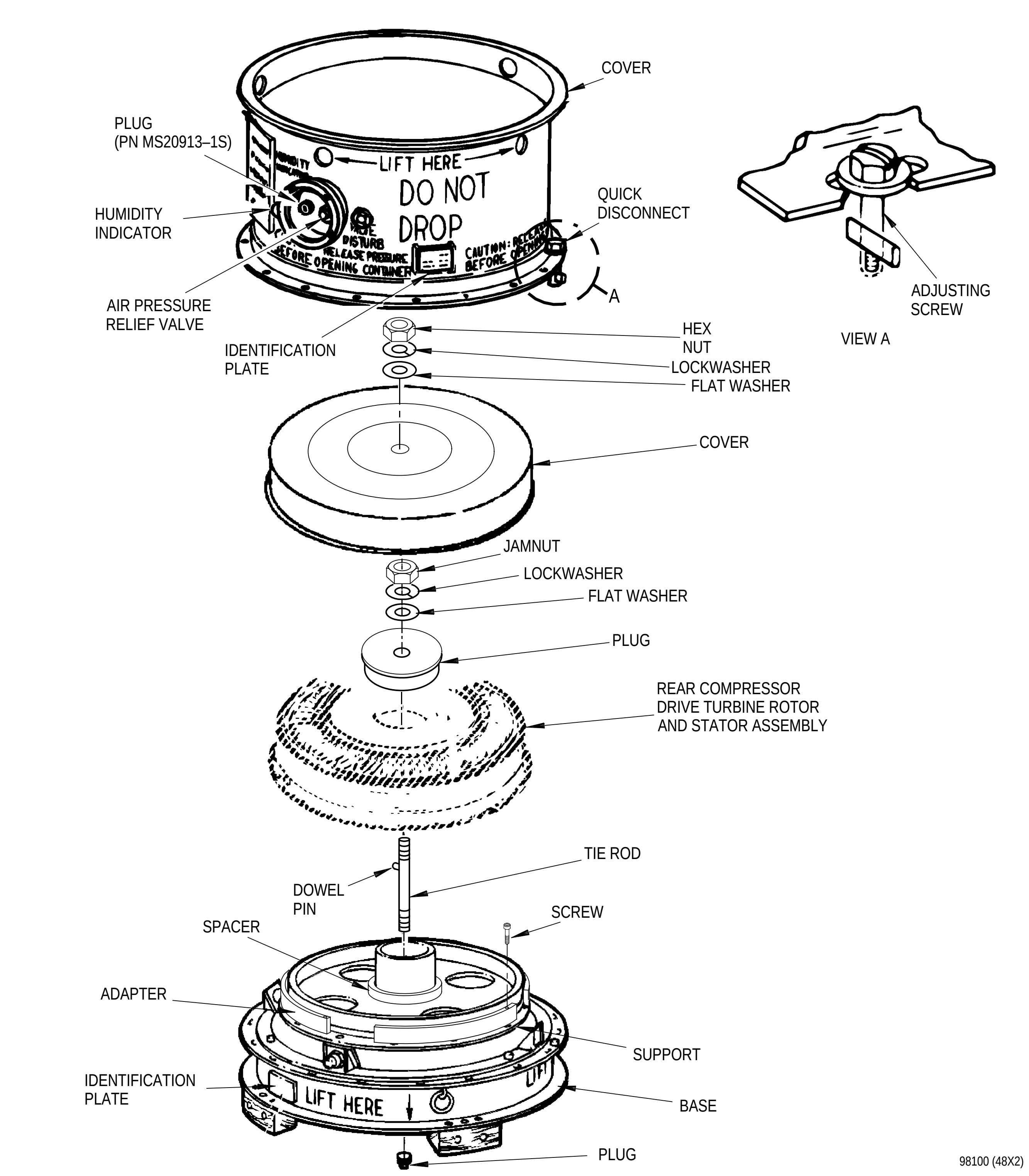


Figure 4. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation Into PN P4078844 Shipping Container

3. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - CONTAINER IDENTIFICATION PLATE REPLACEMENT.

NOTE

Container has two identification plates, one on upper half and one on lower half.

a. Remove damaged identification plate(s) from side of container.

b. Clean identification plate area with ethyl alcohol O-E-760.

c. Select two PN P52715 identification plates from PN P4078919 consumable packaging parts.

d. Mark each PN P52715 identification plate as follows:

CONTAINER: SHIPPING AND STORAGE, METAL REUSABLE

FOR PACKING: REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR

SPEC: MIL-C-5584, MFGRS. PN:

MODEL NO: F100-PW-229

STOCK NO:

e. Peel protective backing sheet off identification plate exposing adhesive surface. Do not handle adhesive surface. Place left edge of plate 10 to 12 inches to right of container vertical centerline with horizontal edge one half to one inch from flange surface. Press firmly over complete plate area. This applies to both halves of container.

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

DISASSEMBLY INTO SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.
This work package introduces the 010 00 through 019 00 series of work packages for disassembling the rear compressor drive turbine into subassemblies. The following work packages are included in this series:

WP No.	Title
011 00	Rear Compressor Drive Turbine - Disassembly into Subassemblies
012 00 through 019 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE -

DISASSEMBLY INTO SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 56

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	26	9	20	31	17
2	23	10	0	32	16
2A Added	23	11	20	33 - 34	26
2B Blank Added	23	12	0	35 - 36	22
3	21	13 - 16	20	37	0
4	20	17	6	38 - 40	20
4A - 4B	21	18 - 19	20	41	19
5	0	20	0	42	0
6	26	21 - 24	20	43	20
6A Added	26	25	6	44	0
6B Blank Added	26	26 - 29	20	45 - 46	21
7	20	30	0	46A - 46B Added	21
8	19			47 - 48	26

REFERENCE MATERIAL REQUIRED

Title		Number
Rear Compressor Drive Turbine Tierod - Turbine - Inspection	- - - - - - - - - - - - - - - - - - -	T.O. 2J-F100-53-8 WP 313 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF CORE MODULE FEATURING ’97 ENHANCEMENT PACKAGE, F100-PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)
2J-F100229(VI)-517	15 SEP 97	D	Reoperation of PN 4069901 or PN 4080301 First Stage Turbine Disk to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA053)
2J-F100229(VI)-518	30 JUN 97	D	Reoperation of PN 4069949 and PN 4080429 First Stage Turbine Air Seal to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/ F-16 Aircraft. (ECP 96QA053)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
PENCIL (CRAYON), SILVER,METAL MARKING (HARD)	COLORBRITE 2101OR COLOR-TEX 1843OR ANADEL NO. 1936

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - REMOVAL OF FIRST STAGE TURBINE ROTOR BLADES	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	ADAPTER, LIFT AND TRUNNION	PWA 26147
	SLING, LIFTING	PWA 56336
	HAND PUMP, HYDRAULIC	PWA 55380
	PLIERS	PWA 53778
	FIXTURE, HOLDING	PWA 71473

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
3	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - REMOVAL OF SECOND STAGE TURBINE ROTOR BLADES	
	ADAPTER, LIFT AND TRUNNION	PWA 26147
	SLING, LIFTING	PWA 56336
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	HAND PUMP, HYDRAULIC	PWA 55380
	PRY BAR, HIGH PRESSURE TURBINE	LM 1009
	FIXTURE, HOLDING	PWA 71474
4	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - DISASSEMBLY	
	ADAPTER, LIFT AND TRUNNION	PWA 26147
	SLING, LIFTING	PWA 56336
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	HAND PUMP, HYDRAULIC	PWA 55380
	PRY BAR, HIGH PRESSURE TURBINE	LM 1009
	ADAPTER SET, TORQUE (PART OF PWA 57830 STAND)	PWA 57895 OR
	ADAPTER SET, TORQUE (PART OF PWA 57765 STAND)	PWA 57504
	PUSHER/PULLER, INSTALL/REMOVE HIGH TURBINE ROTOR AND STATOR ASSEMBLY	PWA 57530
	PLIERS	PWA 53778
	SUPPORT, RETAINING NUTS, TURBINE TIEROD	PWA 57908

ILLUSTRATED SUPPORT EQUIPMENT

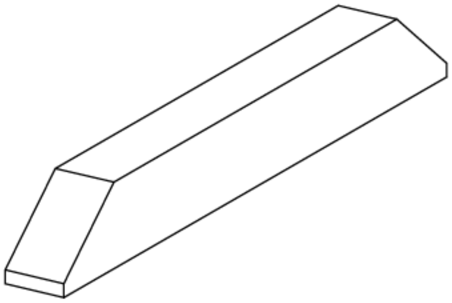


Figure T1. LM 1009 PRY BAR

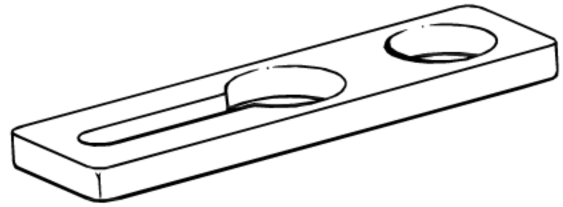


Figure T2. PWA 26147 ADAPTER

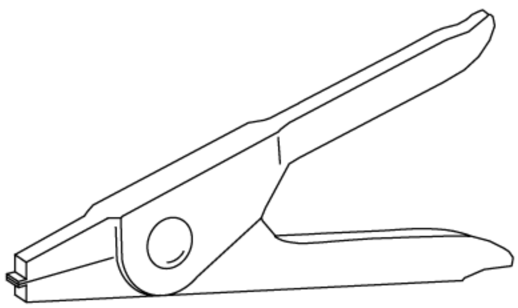


Figure T3. PWA 53778 PLIERS

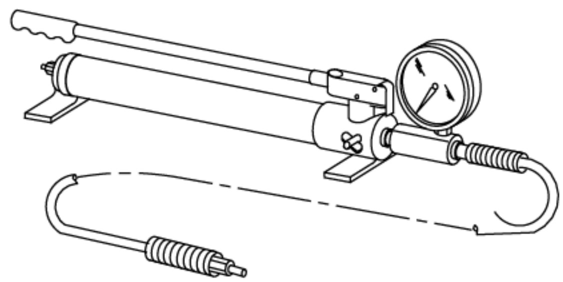


Figure T4. PWA 55380 HAND PUMP

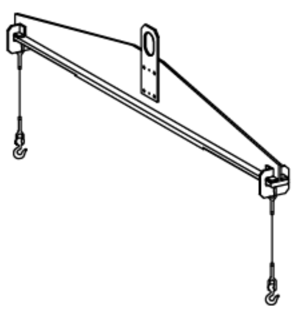


Figure T5. PWA 56336 SLING

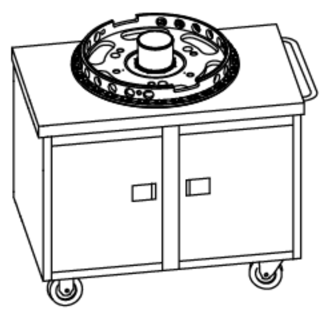


Figure T6. PWA 57503 STAND

ILLUSTRATED SUPPORT EQUIPMENT (continued)

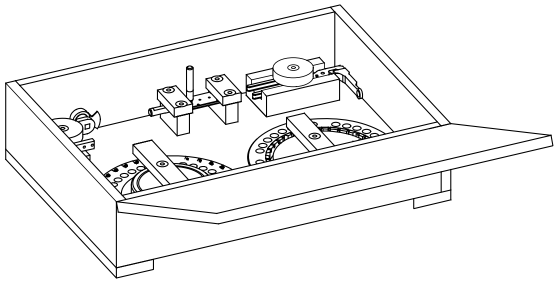


Figure T7. PWA 57504 ADAPTER SET

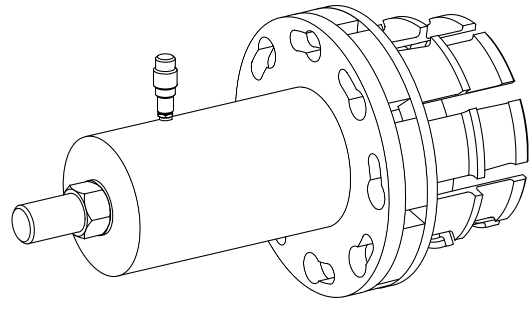


Figure T8. PWA 57530 PUSHER/PULLER

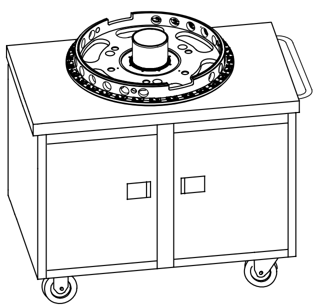


Figure T9. PWA 57765 STAND

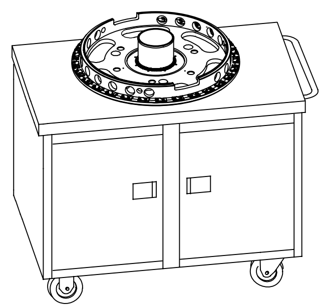


Figure T10. PWA 57830 STAND

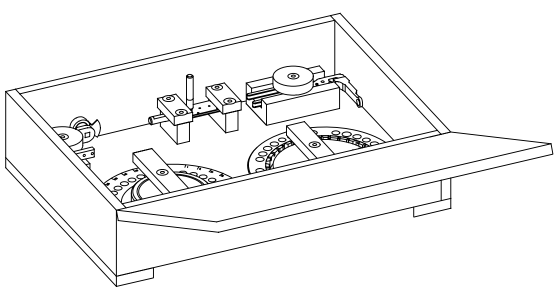


Figure T11. PWA 57895 ADAPTER SET

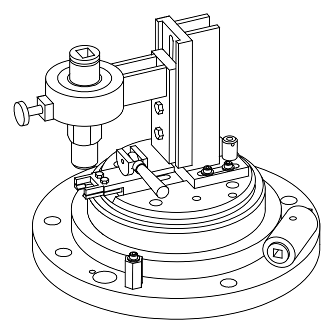


Figure T12. PWA 57908 SUPPORT

ILLUSTRATED SUPPORT EQUIPMENT (continued)

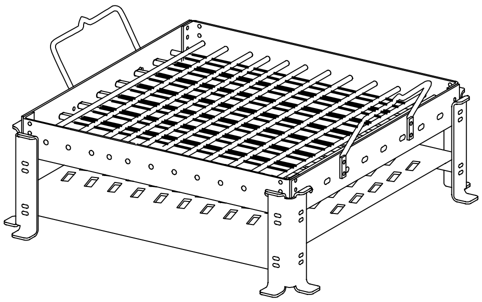


Figure T13. PWA 71473 FIXTURE

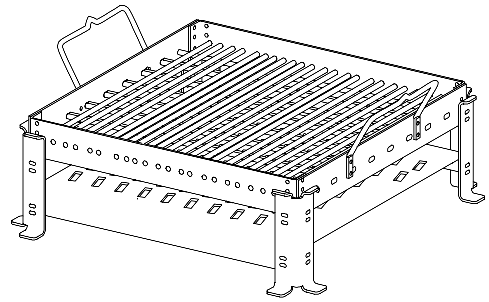


Figure T14. PWA 71474 FIXTURE

1. INTRODUCTION.

a. This work package contains instructions for disassembling rear compressor drive turbine rotor and stator assembly into subassemblies.

b. Paragraphs 2 and 3 contain instructions for removal of 1st and 2nd stage turbine blades.

c. Paragraph 4 contains instructions for complete disassembly of rear compressor drive turbine rotor and stator assembly.

2. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - REMOVAL OF FIRST STAGE TURBINE ROTOR BLADES.
(See Figures 1 through 4.)

a. Install PWA 57830 detail-23 ring(5, figure 1) onto base of stand(6).

NOTE

Lift fixture should already be installed on rotor and stator assembly.

b. Attach PWA 26147 adapters(3) and PWA 56336 sling(1) onto trunnions of lift fixture(4).

c. Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly(2) and lower assembly onto PWA 57830 stand rear face down. Align trunnions of lift fixture with slots in base of PWA 57830 stand. Remove PWA 56336 sling and PWA 26147 adapters.

d. Remove 1st stage turbine air seal(10, figure 2) as follows:

NOTE

Crowfoot wrench NSN 5120-01-348-7323 (Snap On 5/16 inch Flank Drive crowfoot PN TMRX10) can be used without alteration for removal of rivet pins and nuts.

(1) Remove rivet pins and nuts(9 and 11) or bolts and nuts(9A and 11A) and discard.

CAUTION

Use of excessive force while drilling rivets may result in bent disk and air seal tangs.

(2) Remove rivets(12). Discard rivets.

(3) Remove counterweights(13).

(4) Thread PWA 57830 detail-103 shaft(8) into base of stand(15).

(5) Lower detail-19 ring(7) onto 1st stage turbine disk(14).

(6) Lower detail-102 plate(6) onto detail-19 ring(7).

(7) Lower hydraulic cylinder assembly(5) onto detail-102 plate(6).

(8) Lower detail-27 jaws(3) onto 1st stage disk.

(9) Lower detail-97 ring assembly(2) onto hydraulic cylinder assembly(5).

(10) Position detail-27 jaws(3) through ring assembly(2) so that teeth of jaws engage flange of air seal(10). To facilitate installation of jaws, engage teeth at right end of jaw, then roll rest of jaw into place.

CAUTION

Failure to align jaws may result in bent disk and air seal tangs.

(11) Align jaws so that area where tooth is missing is located at scallops with rivet pin holes. Secure jaws to detail-97 ring assembly(2) with cap screws(4).

(12) Thread detail-9 nut(1) onto detail-103 shaft(8) until nut(1) is two to three inches from top of hydraulic cylinder assembly(5).

(13) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

Legend for figure 1

1. PWA 56336 sling
2. Rear compressor drive turbine rotor and stator assembly
3. PWA 26147 adapters
4. Lift fixture
5. Ring
6. PWA 57830 stand

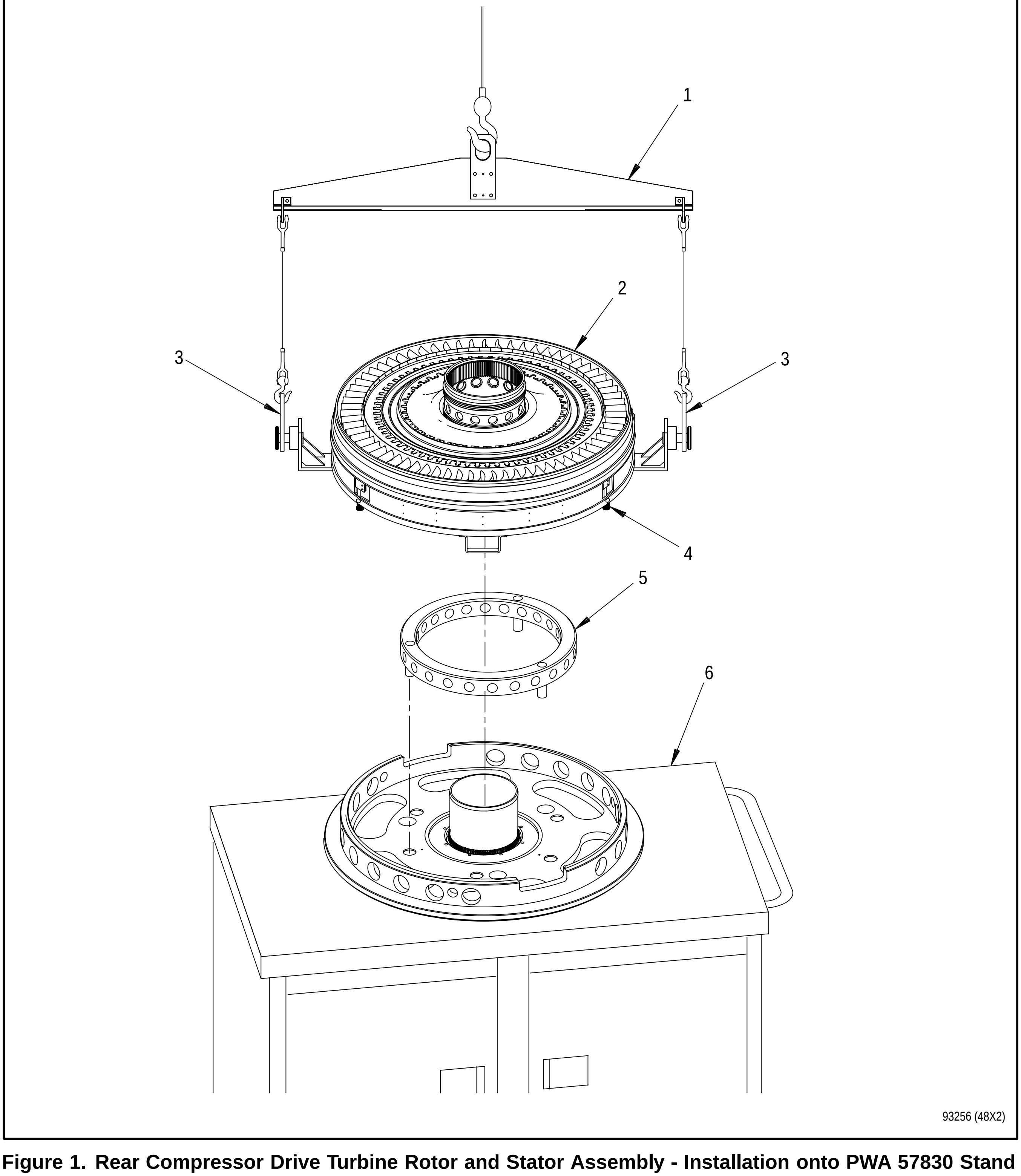


Figure 1. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation onto PWA 57830 Stand

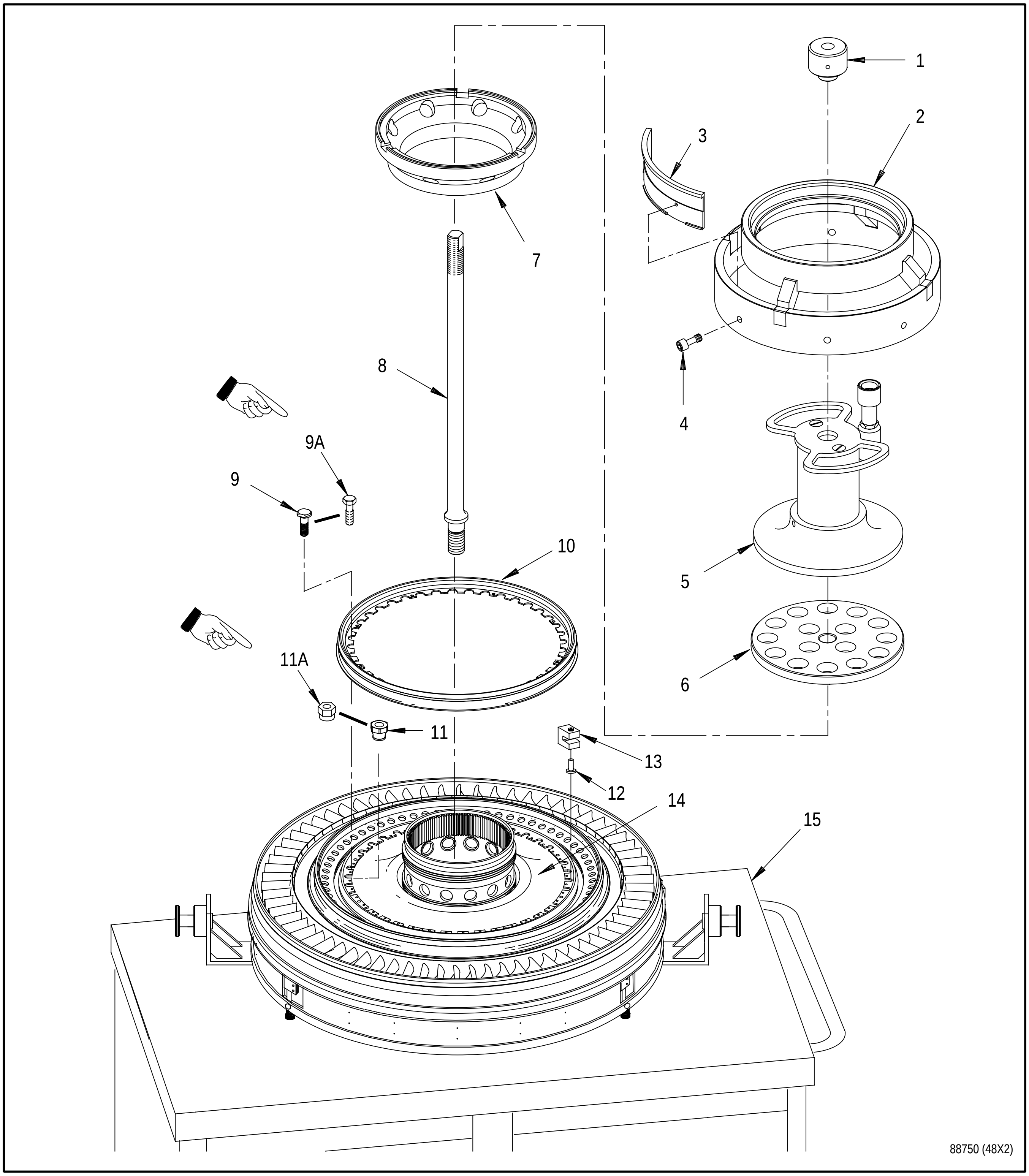


Figure 2. First Stage Turbine Air Seal - Removal

Legend for figure 2

1. Nut
2. Ring assembly
3. Jaws
4. Cap screws
5. Hydraulic cylinder assembly
6. Plate
7. Ring
8. Shaft
9. Rivet pins (0.164 inch)

9A. Bolts (0.190 inch)
10. First stage turbine air seal
11. Nuts (0.164 inch)
11A. Nuts (0.190 inch)
12. Rivet
13. Counterweight
14. First stage turbine disk
15. PWA 57830 stand

NOTE

If air seal starts to cock on snap during removal, slide hammer (detail-109) may be used on opposite side of tool to assist in removal.

(14) Work PWA 55380 pump to unseat air seal(10). Do not exceed 5000 psig pressure. Release pressure from pump; then disconnect pump from hydraulic cylinder assembly(5).

(15) Remove PWA 57830 detail-9 nut(1), detail-27 jaws(3), detail-97 ring assembly(2), hydraulic cylinder assembly(5) detail-102 plate(6) and detail-19 ring(7). Remove air seal(10).

e. Remove turbine air seal spacer(5, figure 3) as follows:

(1) Lower PWA 57830 detail-28 ring assembly(4) onto 1st stage turbine blade front retaining plate(8).

(2) Lower detail-102 plate(3) onto detail-28 ring assembly(4).

(3) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3).

(4) Thread detail-9 nut(1) onto detail-103 shaft(6) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(5) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(6) Work PWA 55380 pump to depress retaining plate(8). Do not exceed 8000 psig pressure.

(7) Spread turbine air seal spacer(5) using PWA 53778 pliers, or equivalent, and remove spacer(5) from 1st stage turbine disk(7).

(8) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(9) Remove PWA 57830 detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-28 ring assembly(4). Remove air seal spacer(5).

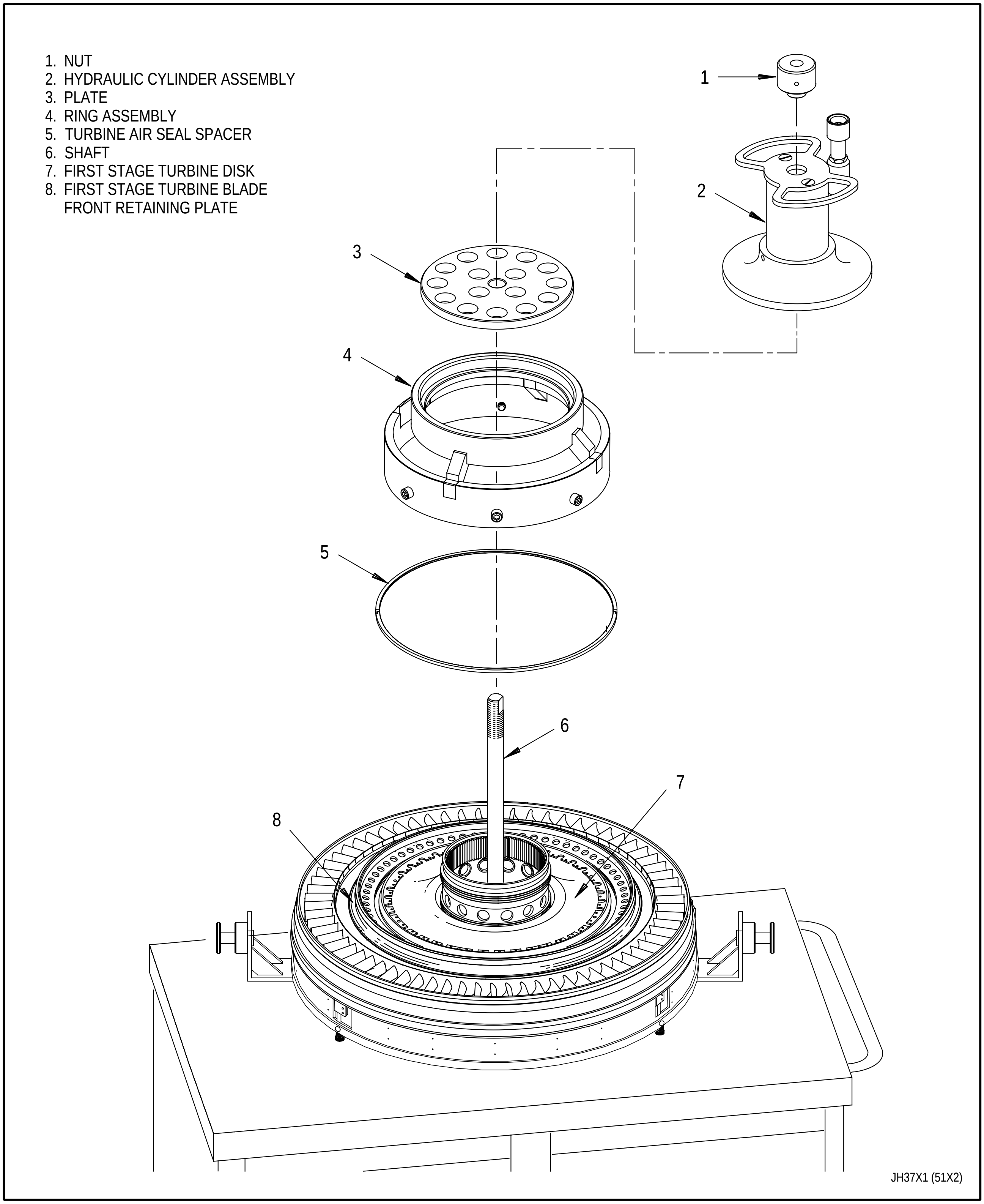


Figure 3. Turbine Air Seal Spacer - Removal

f. Remove 1st stage turbine blade front retaining plate(8, figure 4) as follows:

(1) Lower PWA 57830 detail-19 ring(7) onto 1st stage turbine disk(9), narrow end down.

(2) Lower detail-102 plate(6) onto detail-19 ring(7).

(3) Lower hydraulic cylinder assembly(5) onto detail-102 plate(6).

(4) Attach detail-112 jaws(3) to detail-28 ring assembly(2). Secure with cap screws(4), but do not tighten cap screws at this time.

(5) Lower detail-28 ring assembly(2), with detail-112 jaws(3) attached, onto retaining plate(8) so that jaws engage puller groove in forward ID flange of retaining plate.

(6) Tighten cap screws(4) to secure detail-112 jaws(3) to detail-28 ring assembly(2).

(7) Thread detail-9 nut(1) onto detail-103 shaft(12) so that nut is 2 to 3 inches from hydraulic cylinder assembly(5).

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

(9) Work PWA 55380 pump to unseat retaining plate(8).Do not exceed 5000 psig pressure.

(10) Release pressure from pump; then disconnect pump from hydraulic cylinder assembly(5).

CAUTION

Take care not to damage air seals when removing retaining plate.

(11) Remove detail-9 nut(1), detail-28 ring assembly(2), detail-112 jaws(3), hydraulic cylinder assembly(5), detail-102 plate(6), detail-19 ring(7), and retaining plate(8).

(12) Remove 1st stage turbine rotor seal(13) from retaining plate(8). Discard seal(13).

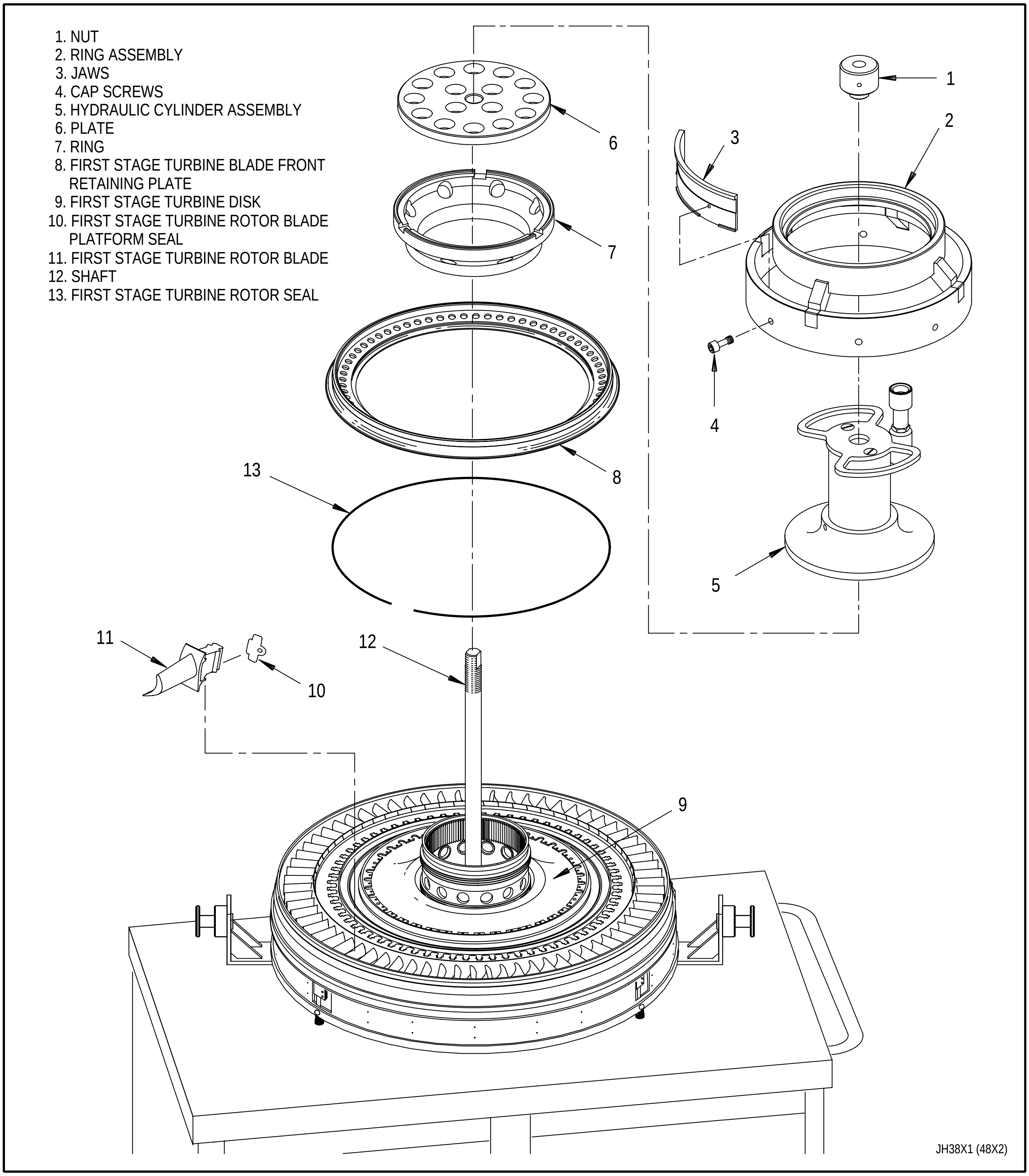


Figure 4. First Stage Turbine Blade Front Retaining Plate and First Stage Turbine Rotor Blades - Removal

g. Mark 1st stage turbine blades(11) in consecutive counterclockwise order on convex side of airfoil. Make index mark on 1st stage disk(9) as to location of No. 1 blade using Colorbrite No. 2101 silver pencil or equivalent to mark blades and disk.

h. Remove 1st stage blades(11) and 1st stage turbine rotor blade platform seals(10). Place 1st stage turbine blades into PWA 71473 fixture, blade tips down. Discard platform seals.

3. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - REMOVAL OF SECOND STAGE TURBINE ROTOR BLADES. (See Figures 5 through 8.)

NOTE

Lift fixture should already be installed on rotor and stator assembly.

a. Attach PWA 26147 adapters(3, figure 5) and PWA 56336 sling(1) onto trunnions of lift fixture(2).

b. Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly(4) and lower rotor and stator assembly onto PWA 57830 stand(5) front end down. Engage splines of front turbine hub assembly with center of stand(5).

c. Remove PWA 56336 sling(1), PWA 26147 adapters(3) and lift fixture(2).

d. Retract turbine blade retaining plate ring(6, figure 6) as follows:

(1) Thread PWA 57830 detail-103 shaft(7) into base of stand(9).

(2) Lower detail-96 clamp assembly(4) onto rear flange of 2nd stage rear turbine blade retaining plate(10).

Legend for figure 5

1. PWA 56336 sling
2. Lift fixture
3. PWA 26147 adapters
4. Rear compressor drive turbine rotor and stator assembly
5. PWA 57830 stand

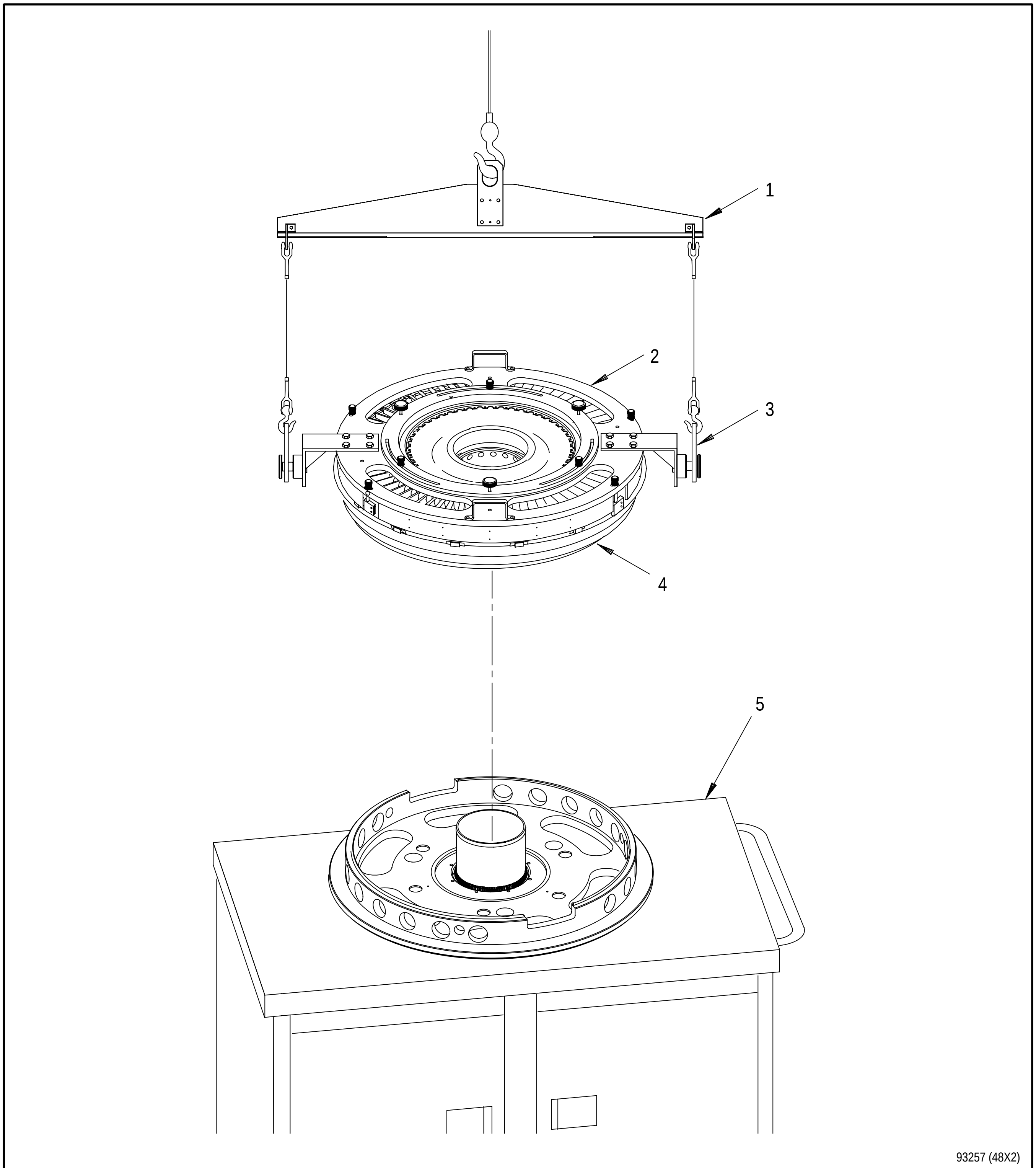


Figure 5. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation onto PWA 57830 Stand

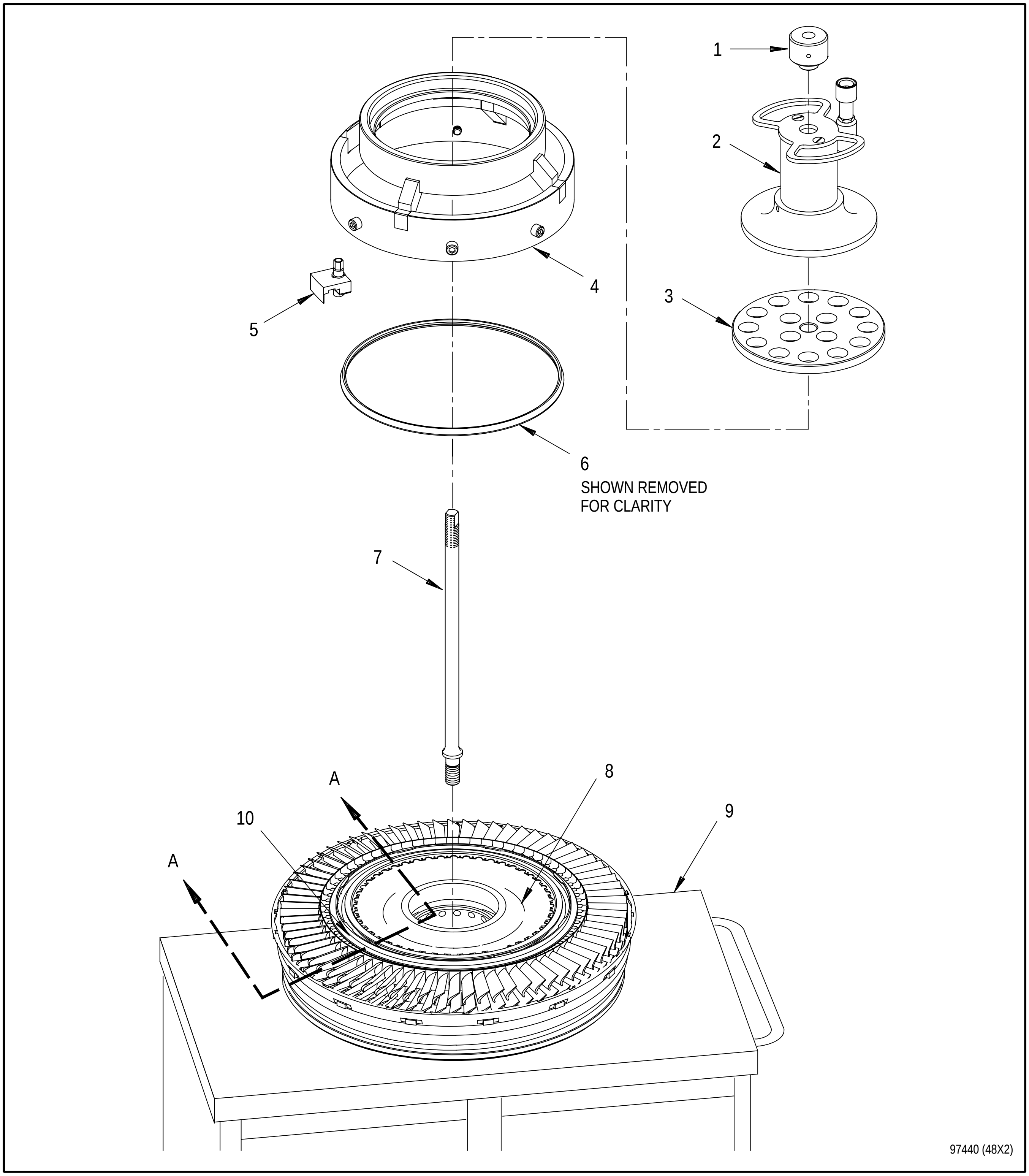
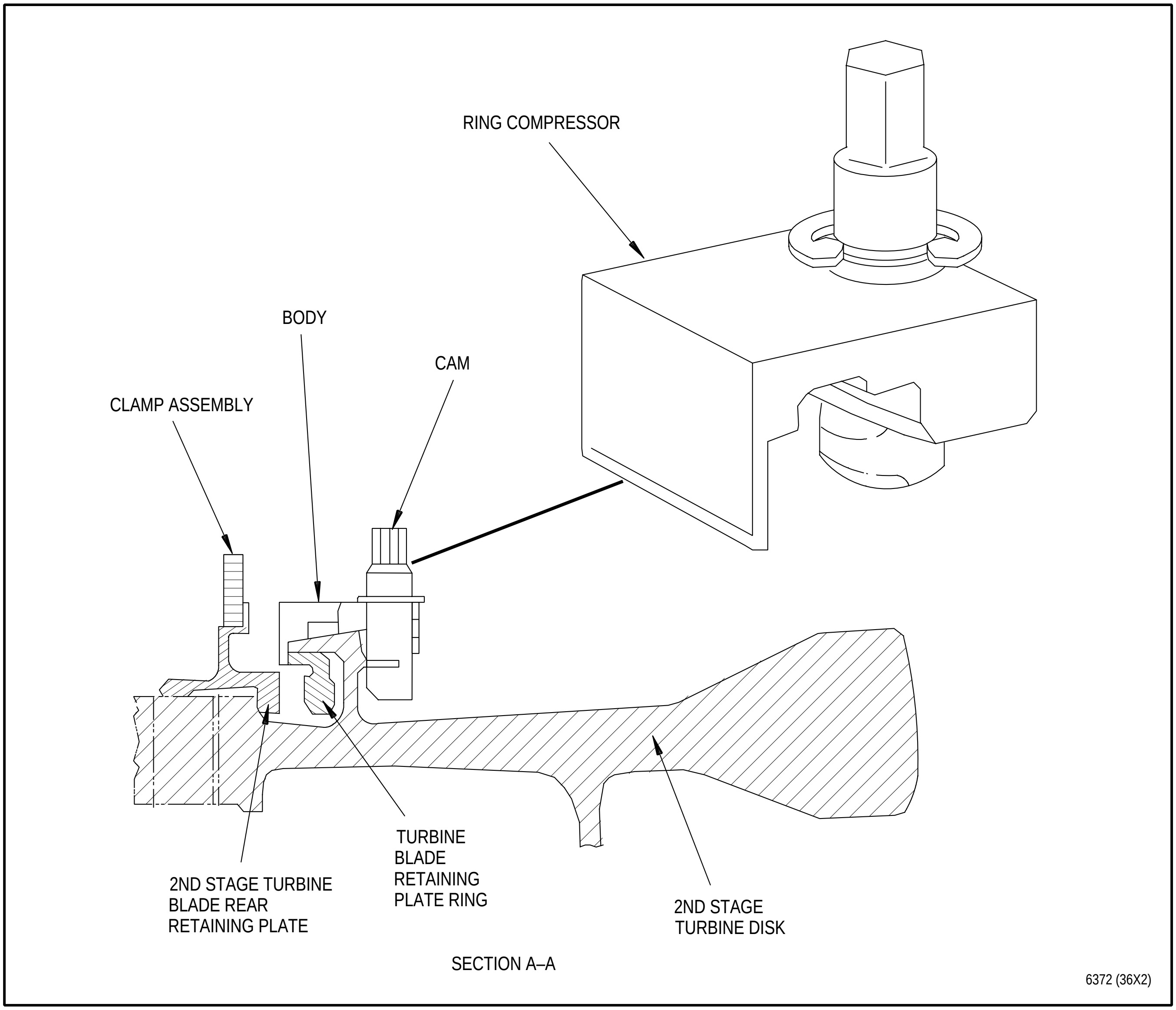


Figure 6. Ring Compressors - Installation (Sheet 1 of 2)



1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Clamp assembly
5. Ring compressor
6. Turbine blade retaining plate ring
7. Shaft
8. Second stage turbine disk
9. PWA 57830 stand
10. Second stage turbine blade rear retaining plate

Figure 6. Ring Compressors - Installation (Sheet 2 of 2)

(3) Lower detail-102 plate(3) onto detail-96 clamp assembly(4).

(4) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3).

(5) Thread detail-9 nut(1) onto detail-103 shaft(7) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(6) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(7) Work PWA 55380 pump to depress retaining plate(10) until retaining plate moves freely into 2nd stage turbine disk(8). Do not exceed 5000 psig pressure when depressing 2nd stage rear turbine blade retaining plate.

(8) Seat turbine blade retaining plate ring(6) into slot of 2nd stage turbine disk(8) using LM 1009 pry bar.

Figure 7. Deleted

(9) Install set of six PWA 57830 detail-111 ring compressors (5,figure 6) to secure ring(6) as follows:

NOTE

Cam portion of ring compressors shall be facing outward prior to installation.

(a) Turn hex-head portion of cam so that cam is facing outward from body.

NOTE

Do not attempt to install ring compressors over counterweights.

(b) Position one ring compressor 180 degrees from split in turbine blade retaining plate ring so that cam fits into scallop in 2nd stage turbine disk rear counterweight flange and lip of body engages OD of retaining plate ring.

(c) Press down on ring compressor to ensure it is seated; then turn hex-head portion of cam to compress retaining plate ring.

(d) Repeat steps (a) through (c) until remaining five ring compressors are installed equally spaced.

(e) Verify turbine blade retaining plate ring is secured and clear of second stage turbine blade retaining plate.

(10) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(11) Remove PWA 57830 detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-96 clamp assembly(4).

e. Remove 2nd stage rear turbine blade retaining plate(7, figure 8) as follows:

(1) Lower PWA 57830 detail-100 ring(6) onto ID of 2nd stage turbine disk(10).

(2) Lower hydraulic cylinder assembly(5) onto detail-100 ring(6).

(3) Position detail-94 jaws(3) on detail-96 clamp assembly(2). Secure with cap screws(4), but do not tighten cap screws at this time.

(4) Lower detail-96 clamp assembly(2), with detail-94 jaws(3) attached, onto retaining plate(7) so that lip of jaws engages rear flange of retaining plate. Tighten cap screws(4) to secure detail-94 jaws(3). Rotate detail-96 clamp assembly clockwise to lock detail-94 jaws in place.

(5) Thread detail-9 nut(1) onto detail-103 shaft(13) so that nut is 2 to 3 inches from hydraulic cylinder assembly(5).

(6) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

(7) Work PWA 55380 pump to unseat retaining plate(7). Do not exceed 5000 psig pressure.

(8) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

(9) Remove PWA 57830 detail-9 nut(1), detail-96 clamp assembly(2) with retaining plate(7), hydraulic cylinder assembly(5), and detail-100 ring(6). Remove retaining plate(7) from detail-96 clamp assembly and 2nd stage turbine rotor seal(9). Discard seal(9).

(10) Remove detail-111 ring compressors(5, figure 6).

(11) Remove turbine blade retaining plate ring(8, figure 8).

f. If applicable, mark 2nd stage turbine rotor blades(12) in consecutive clockwise order on convex side of airfoil starting with blade at No. 1 slot (slot located between X marks on rear face of 2nd stage disk) using Colorbrite No. 2101 silver pencil or equivalent.

g. Remove 2nd stage blades(12) and place into PWA 71474 fixture, blade tips down.

Legend for figure 8

1. Nut
2. Clamp assembly
3. Jaw
4. Cap screws
5. Hydraulic cylinder assembly
6. Ring
7. Second stage turbine blade rear retaining plate
8. Turbine blade retaining plate ring
9. Second stage turbine rotor seal
10. Second stage turbine disk
11. PWA 57830 stand
12. Second stage turbine rotor blade
13. Shaft

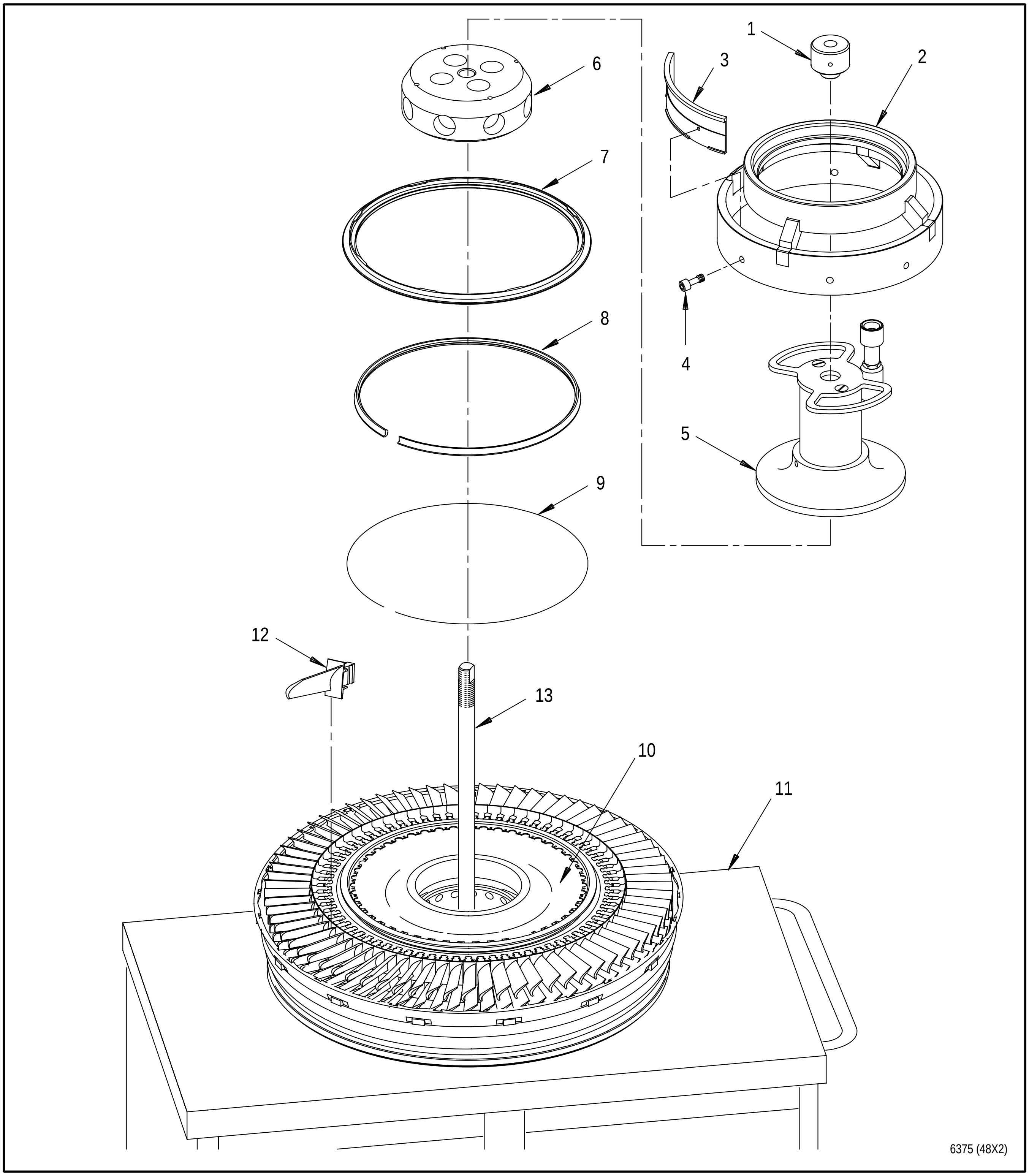


Figure 8. Second Stage Turbine Blade Rear Retaining Plate - Removal

4. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - DISASSEMBLY.
(See Figures 9 through 22.)

NOTE

Lift fixture should already be installed on rotor and stator assembly.

a. Attach PWA 26147 adapters(3, figure 9) and PWA 56336 sling(1) onto trunnions of lift fixture(2).

b. Using an overhead hoist, lift rear compressor drive turbine rotor and stator assembly(4) and lower rotor and stator assembly(4) onto stand(5) front end down. Engage splines of front turbine hub assembly with center of stand(5).

c. Remove PWA 56336 sling(1), PWA 26147 adapters(3), and lift fixture(2).

d. Retract turbine blade retaining plate ring(6, figure 10) as follows:

(1) Thread PWA 57830 detail-103 shaft(7) into base of stand(9).

(2) Lower detail-96 clamp assembly(4) onto rear flange of 2nd stage rear turbine blade retaining plate(10).

(3) Lower detail-102 plate(3) onto detail-96 clamp assembly(4).

(4) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3).

(5) Thread detail-9 nut(1) onto detail-103 shaft(7) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

Legend for figure 9

1. PWA 56336 sling
2. Lift fixture
3. PWA 26147 adapters
4. Rear compressor drive turbine rotor and stator assembly
5. PWA 57830 stand

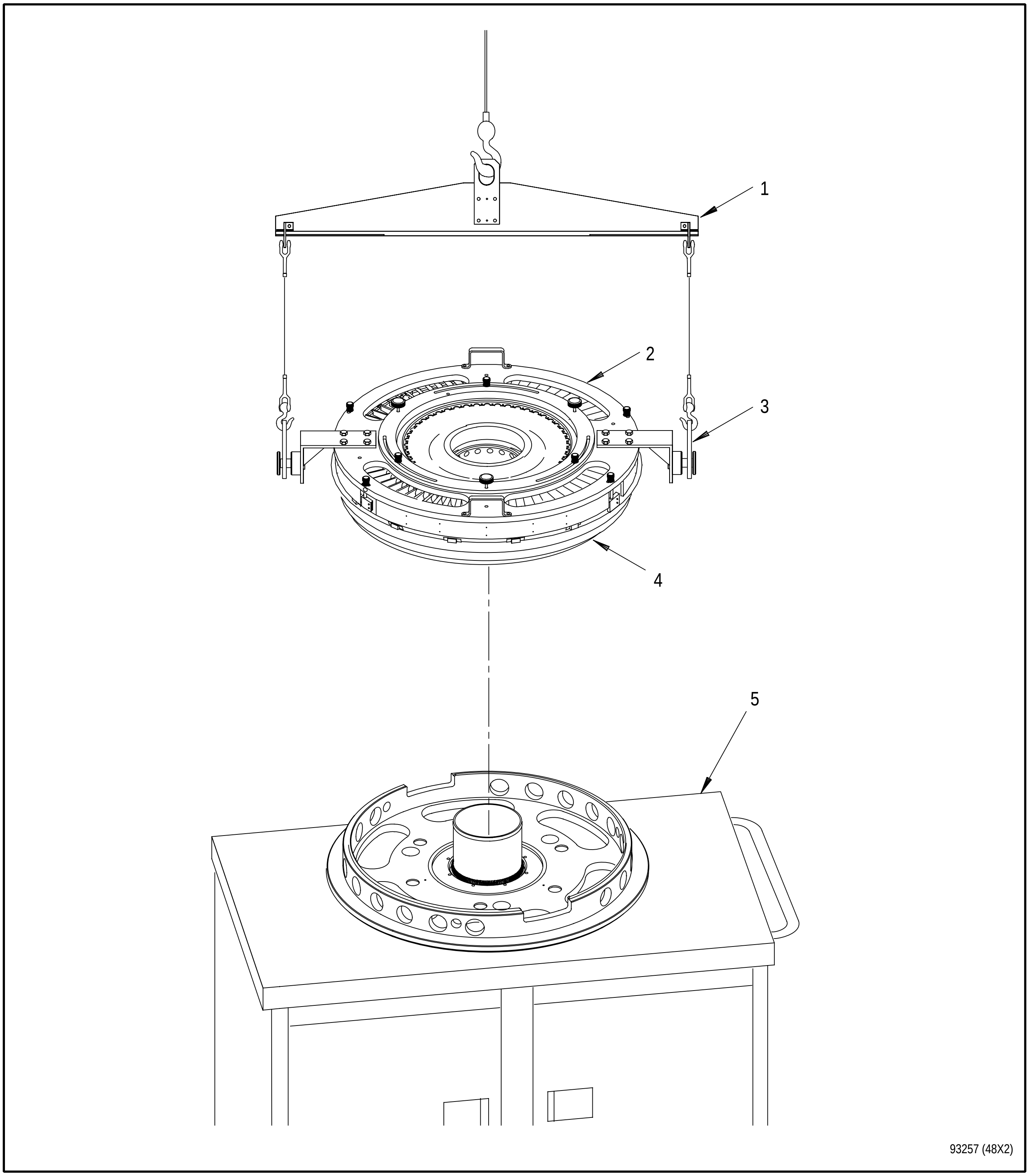


Figure 9. Rear Compressor Drive Turbine Rotor and Stator Assembly - Installation onto PWA 57830 Stand

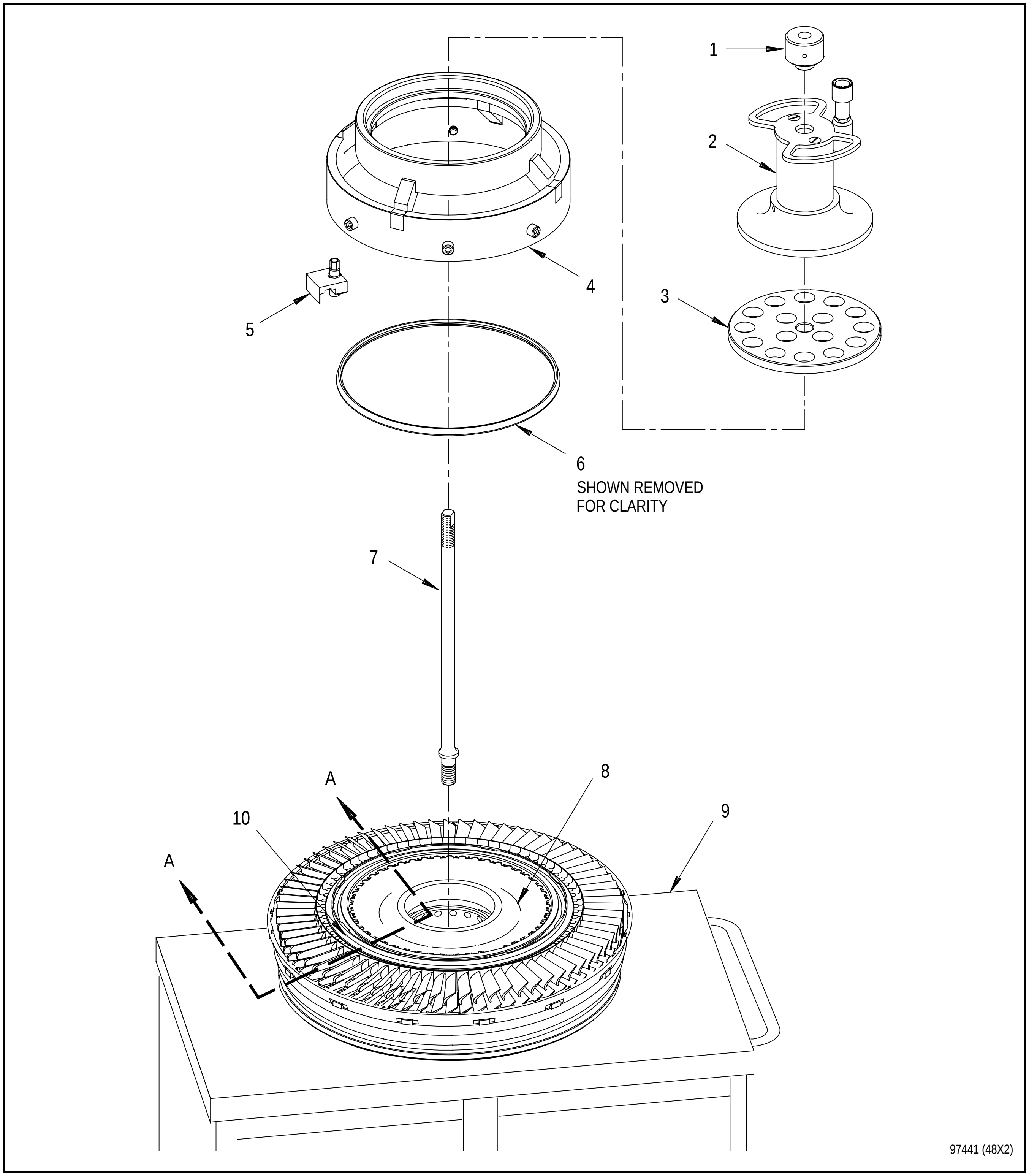
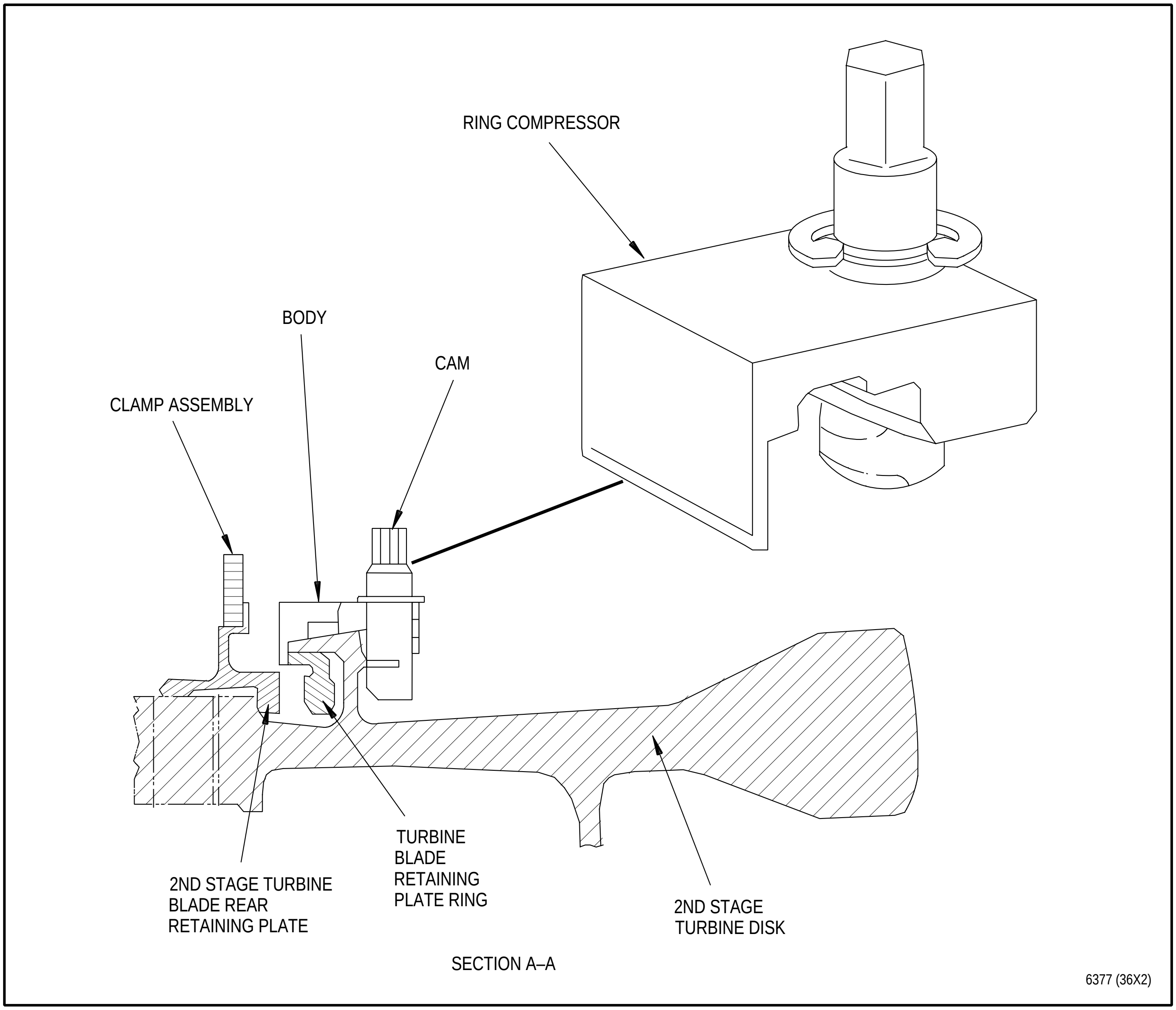


Figure 10. Ring Compressors - Installation (Sheet 1 of 2)



1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Clamp assembly
5. Ring compressor
6. Turbine blade retaining plate ring
7. Shaft
8. Second stage turbine disk
9. PWA 57830 stand
10. Second stage turbine blade rear retaining plate

Figure 10. Ring Compressors - Installation (Sheet 2 of 2)

(6) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(7) Work PWA 55380 pump to depress retaining plate(10) until retaining plate moves freely into slot of 2nd stage turbine disk(8). Do not exceed 5000 psig pressure when depressing 2nd stage rear turbine blade retaining plate.

(8) Seat turbine blade retaining plate ring(6) into slot of 2nd stage turbine disk(8) using LM 1009 pry bar.

Figure 11. Deleted.

(9) Install set of six PWA 57830 detail-111 ring compressors(5, figure 10) to secure ring(6) as follows:

(a) Turn hex-head portion of cam so that cam is facing outward from body.

NOTE

Do not attempt to install ring compressors over counterweights.

(b) Position one ring compressor 180° from split in turbine blade retaining plate ring so that cam fits into scallop in 2nd stage turbine disk rear counterweight flange and lip of body engages OD of retaining plate ring.

(c) Press down on ring compressor to ensure it is seated; then turn hex-head portion of cam to compress retaining plate ring.

(d) Repeat steps (a) through (c) until remaining five ring compressors are installed equally spaced.

(e) Verify turbine blade retaining plate ring is secured and clear of second stage turbine blade retaining plate.

(10) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(11) Remove PWA 57830 detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-96 clamp assembly(4).

e. Remove 2nd stage turbine blade rear retaining plate(7, figure 12) as follows:

(1) Lower PWA 57830 detail-100 ring(6) onto ID of 2nd stage turbine disk(10).

(2) Lower hydraulic cylinder assembly(5) onto detail-100 ring(6).

(3) Position detail-94 jaws(3) on detail-96 clamp assembly(2). Secure with cap screws(4), but do not tighten cap screws at this time.

(4) Lower detail-96 clamp assembly(2), with detail-94 jaws attached, onto retaining plate(7) so that lip of jaws engage rear flange of retaining plate. Tighten cap screws(4) to secure detail-94 jaws(3). Rotate detail-96 clamp assembly counterclockwise to lock detail-94 jaws in place.

(5) Thread detail-9 nut(1) onto detail-103 shaft(13) so that nut is 2 to 3 inches from hydraulic cylinder assembly(5).

(6) Connect PWA 55380 pump to hydraulic cylinder ring assembly(5).

(7) Work PWA 55380 pump to unseat retaining plate(7). Do not exceed 5000 psig pressure.

(8) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

(9) Remove PWA 57830 detail-9 nut(1), detail-96 clamp assembly(2) with retaining plate(7), hydraulic cylinder assembly(5), detail-100 ring(6), and detail-103 shaft(13). Remove retaining plate(7) from detail-96 clamp assembly and 2nd stage turbine rotor seal(9). Discard seal(9).

(10) Remove detail-111 ring compressors(5, figure 10).

(11) Remove turbine blade retaining plate ring(8, figure 12).

f. Remove 2nd stage turbine rotor blades(12) as follows:

(1) If applicable, mark 2nd stage blades in consecutive clockwise order on convex side of airfoil starting with blade at No. 1 blade slot (slot located between X marks on rear face of 2nd stage disk) using Colorbrite No. 2101 silver pencil or equivalent.

(2) Remove 2nd stage blades(12).

Legend for figure 12

1. Nut
2. Clamp assembly
3. Jaw
4. Cap screws
5. Hydraulic cylinder assembly
6. Ring
7. Second stage turbine blade rear retaining plate
8. Turbine blade retaining plate ring
9. Second stage turbine rotor seal
10. Second stage turbine disk
11. PWA 57830 stand
12. Second stage turbine rotor blade
13. Shaft

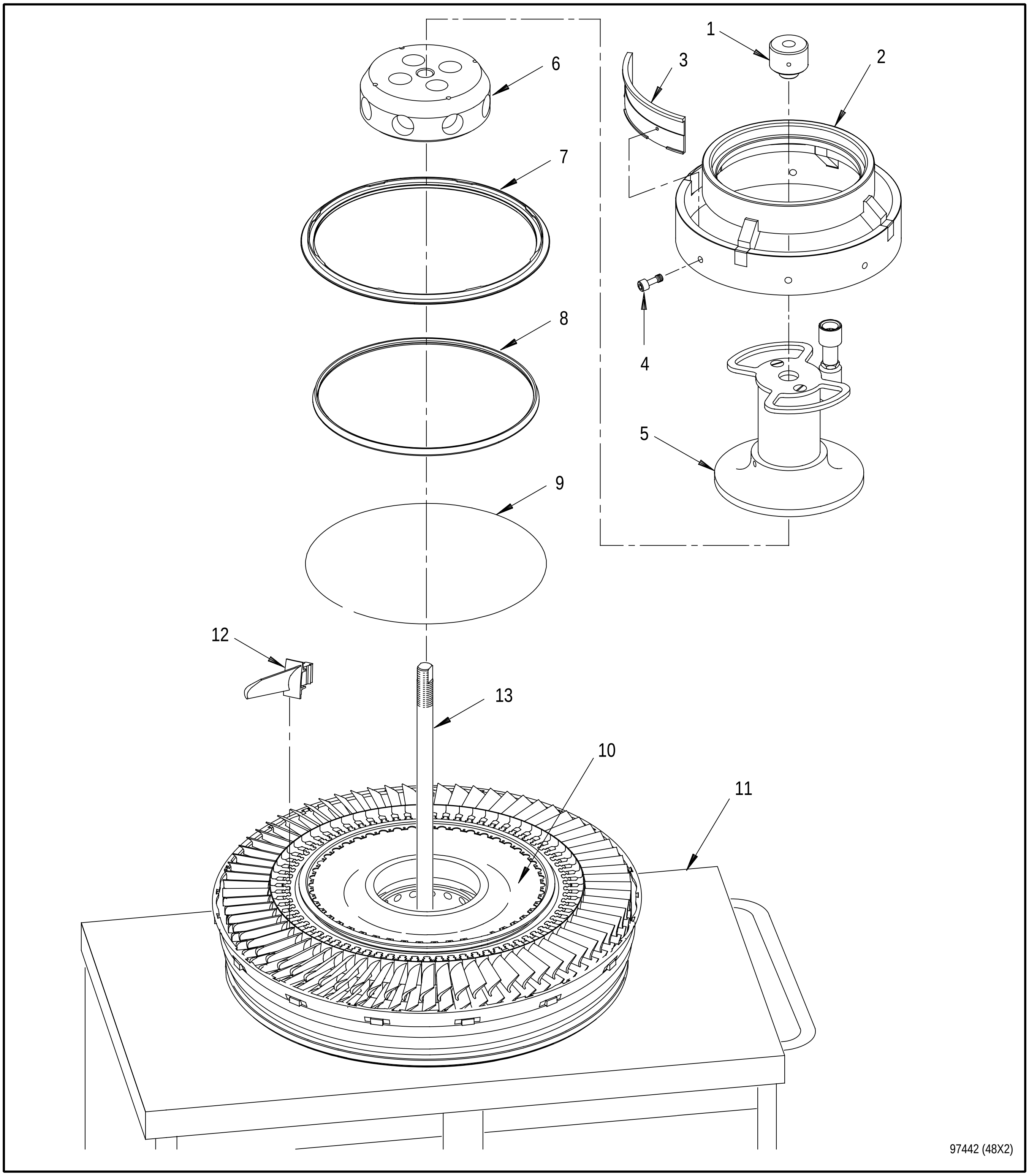


Figure 12. Second Stage Turbine Blade Rear Retaining Plate - Removal

g. Remove tierod nuts(3, figure 13) as follows:

(1) Locate No. 1 tierod(5):

(a) Locate X marks on rear face of 2nd stage disk(6). Blade slot between X marks is 12 o’clock position.

(b) Locate first tierod in clockwise direction from 12 o’clock position. This is No. 1 tierod. Mark location using Colorbrite No. 2101 silver pencil or equivalent.

(2) Install PWA 57895 detail-4-4 locator ring assembly(2) so that hole in ring marked 1 is directly above No. 1 tierod. Secure locator ring assembly(2) with set screws.

NOTE

Do not unbend key washer tabs. Loosening tierod nuts will straighten tabs.

(3) Loosen tierod nuts(3) 1/4 turn at a time, in sequence stamped on locator ring(2) until torque is relieved. Use standard wrench or breaker bar and detail-4-3 wrench assembly(1) to loosen tierod nuts.

(4) Remove detail-4-4 locator ring assembly(2).

(5) Remove tierod nuts(3).

(6) Remove key washers(4). Discard key washers(4).

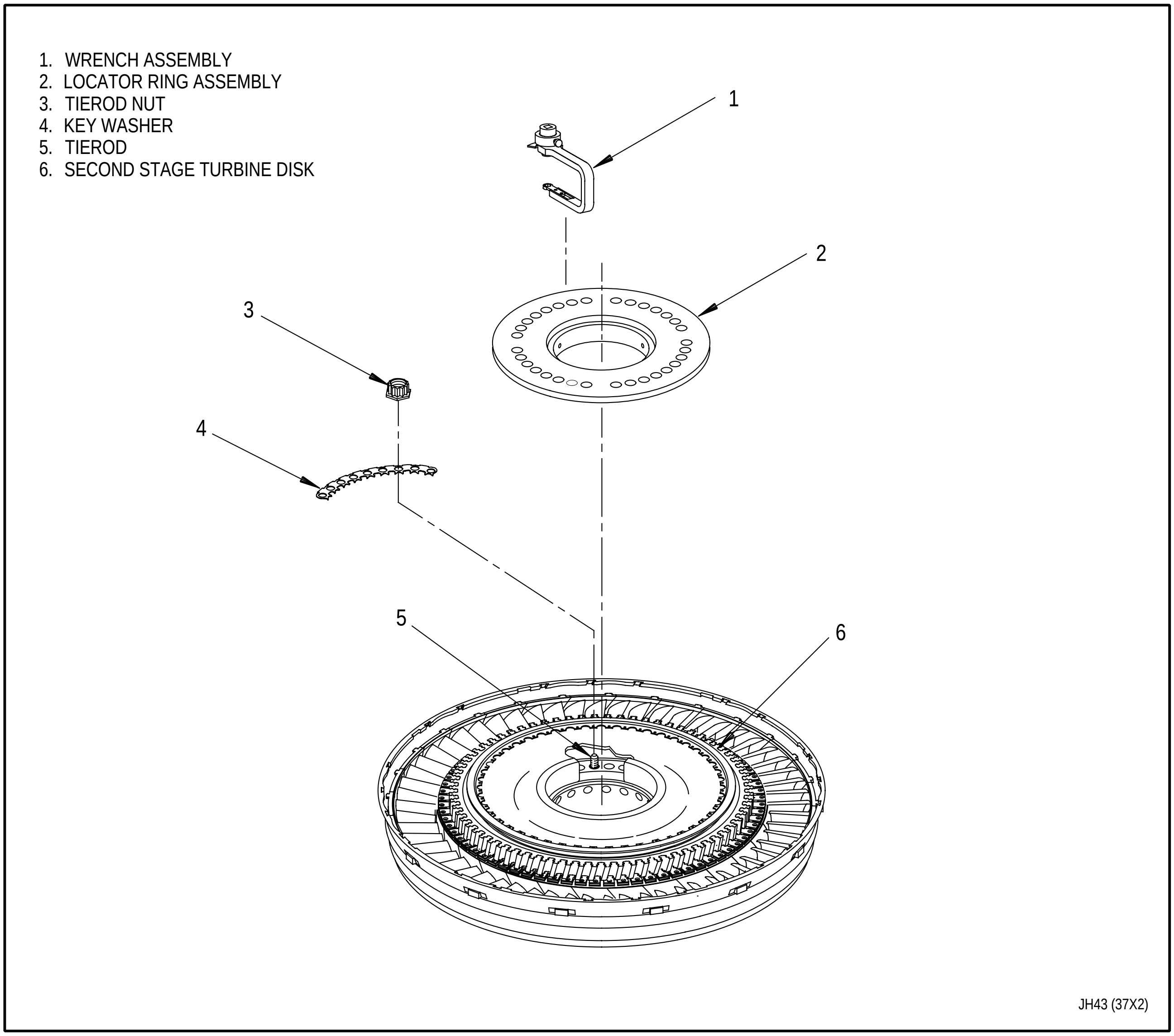


Figure 13. Tierod Nuts - Removal

h. Remove 2nd stage turbine disk(6, figure 14) using PWA 57530 puller as follows:

(1) Remove flange nut(1) and separate hydraulic cylinder(2) and coupler(3) from jaw segments(4) and ring(5).

(2) Install jaw segments(4) so that jaws engage 2nd stage disk bore ID.

(3) Lower coupler(3) into ID of jaw segments(4) until coupler(3) is seated on rear face of turbine front hub assembly.

(4) Ensure hydraulic cylinder(2) is positioned so that coupler(9) is outward, away from adapter(10). Thread cylinder into adapter.

(5) Lower onto jaw segments(4). Rotate hydraulic cylinder clockwise to engage; then tighten bolts(8) to secure.

(6) Thread flange nut(1) onto threaded rod until flange of nut is approximately one inch from face of hydraulic cylinder(2).

(7) Connect PWA 55380 pump to coupler(9) on PWA 57530 puller hydraulic cylinder(2).

CAUTION

Exceeding specified psig pressure when removing 2nd stage disk may result in parts and/or tooling damage.

NOTE

- Second stage turbine blade retaining plate assembly should remain with 1st stage turbine disk.

- If 2nd stage turbine blade retaining plate assembly remains with 2nd stage turbine disk, refer to step u. for removal of retaining plate assembly.

(8) Work PWA 55380 pump to remove 2nd stage disk(6). Do not exceed 5000 psig pressure when removing 2nd stage disk.

(9) Release pressure from PWA 55380 pump; then disconnect pump from PWA 57530 puller hydraulic coupler(9).

(10) Remove PWA 57530 puller. Remove 2nd stage disk(6).

(11) Remove 2nd stage turbine rotor seal(7). Discard seal.

Legend for figure 14

1. Flange nut
2. Hydraulic cylinder
3. Coupler
4. Jaw segments
5. Ring
6. Second stage turbine disk
7. Second stage turbine rotor seal
8. Bolts
9. Hydraulic coupler
10. Adapter

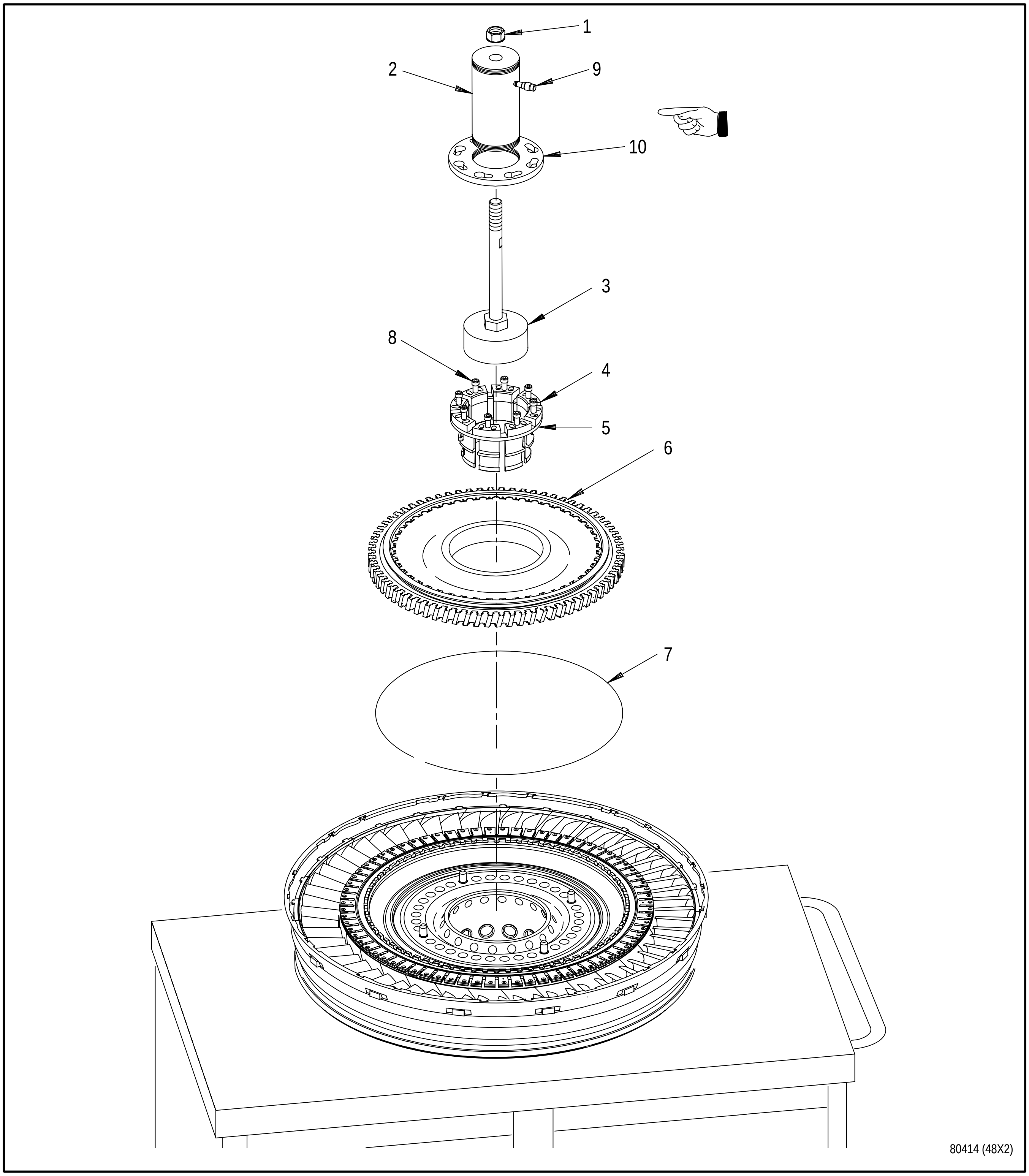


Figure 14. Second Stage Turbine Disk - Removal

i. Remove 2nd stage turbine blade retaining plate assembly(8, figure 15) as follows:

(1) Install PWA 57830 detail-89 ring clamp(1, figure 16) onto rear flange of duct and support set. Tighten knobs to secure ring clamp.

(2) Thread PWA 57830 detail-103 shaft(7, figure 15) into base of stand.

(3) Lower detail-100 ring(6) onto face of rear flange of turbine front hub assembly(9).

(4) Lower hydraulic cylinder assembly(5) onto detail-100 ring(6).

(5) Lower detail-96 clamp assembly(2) onto hydraulic cylinder assembly(5).

(6) Install detail-25 jaw set(3) through detail-96 clamp assembly(2) so that flange of jaw engages rear flange ID of retaining plate(8). Secure jaw set(3) to clamp assembly(2) with cap screws(4).

(7) Thread detail-9 nut(1) onto detail-103 shaft(7) so that nut is approximately 2 to 3 inches from hydraulic cylinder assembly(5).

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

(9) Work PWA 55380 pump to unseat retaining plate(8). Do not exceed 5000 psig pressure.

(10) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

CAUTION

Take care not to damage air seals when removing retaining plate.

(11) Remove PWA 57830 detail-9 nut(1), detail-96 clamp assembly(2), detail-25 jaw set(3), hydraulic cylinder assembly(5), detail-100 ring(6), and detail-103 shaft(7). Remove retaining plate(8).

(12) Remove retaining plate damper(10).

Legend for figure 15

1. Nut
2. Clamp assembly
3. Jaw set
4. Cap screws
5. Hydraulic cylinder assembly
6. Ring
7. Shaft
8. Second stage turbine blade retaining plate assembly
9. Turbine front hub assembly
10. Retaining plate damper

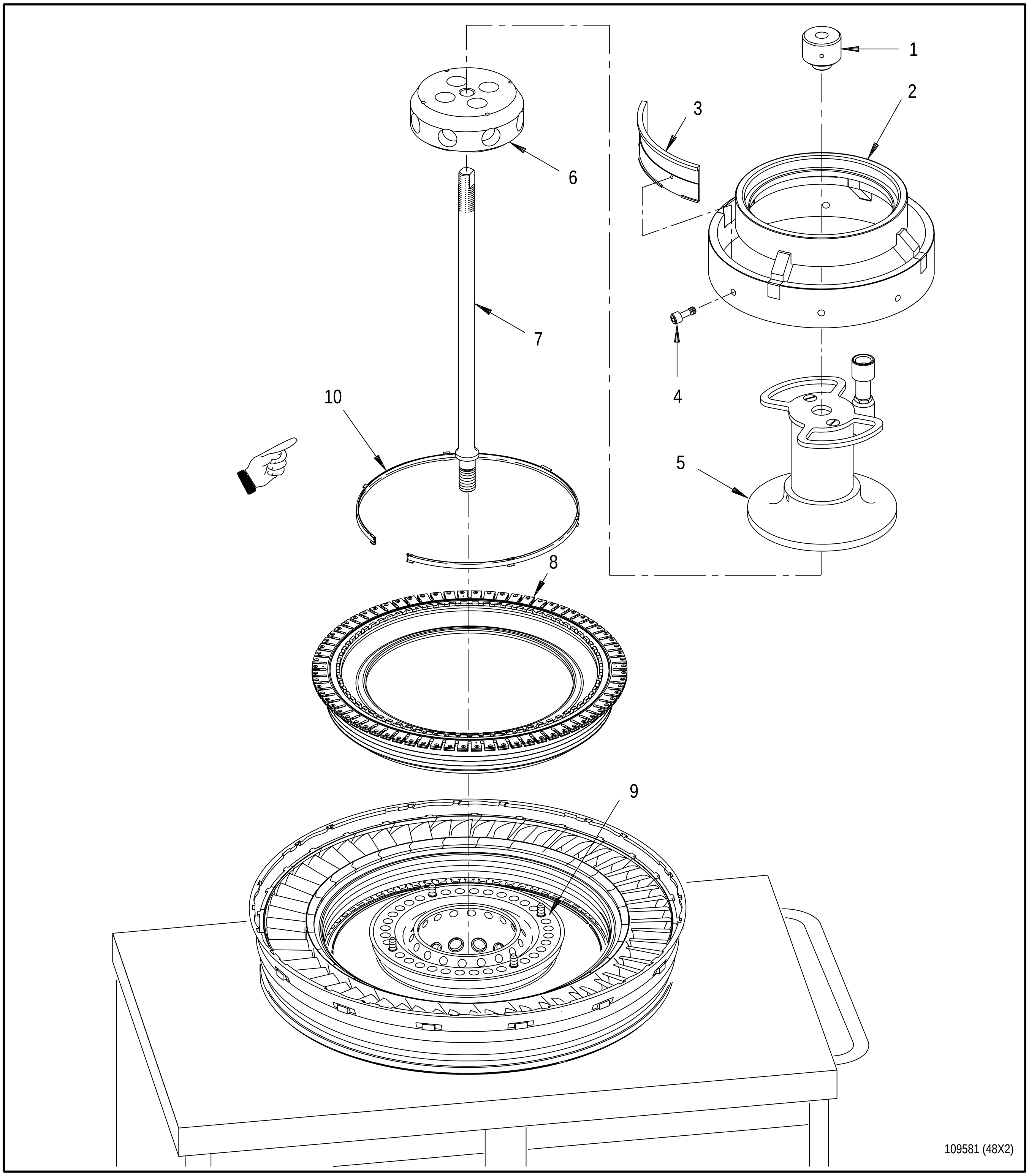


Figure 15. Second Stage Turbine Blade Retaining Plate Assembly - Removal

j. Remove 1st stage turbine duct and support set, 2nd stage turbine vanes, and 2nd stage turbine air sealing ring assembly(2, figure 16) as follows:

(1) If not installed, install PWA 57830 detail-89 ring clamp(1) onto rear flange of duct and support set(2). Tighten knobs to secure ring clamp(1).

(2) Lift duct and support set(2) and place on bench front end down.

k. Remove 1st stage turbine blade rear retaining plates(1, figure 17) as follows:

(1) Mark retaining plates(1) in consecutive clockwise order using Colorbrite No. 2101 silver pencil or equivalent. No. 1 retaining plate is located by X marks on rear face of 1st stage turbine disk(3) blade slots or by two X marks on rear OD of turbine front hub assembly(6).

(2) Remove retaining plates(1) from 1st stage turbine disk(3).

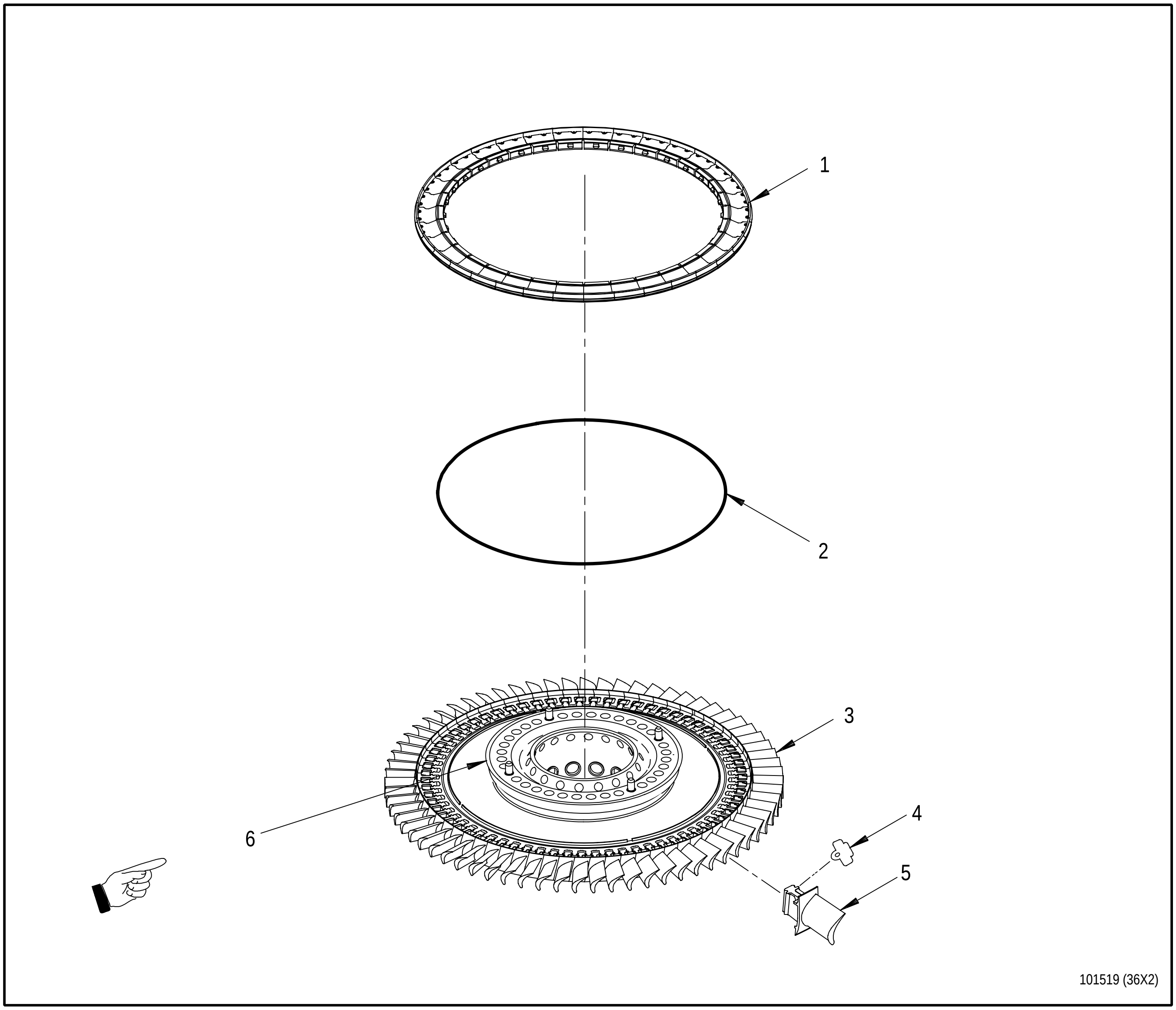
(3) Remove 1st stage turbine rotor seal(2). Discard seal(2).

l. Remove 1st stage turbine rotor blades(5) as follows:

(1) Mark 1st stage blades(5) in consecutive clockwise order on convex side of airfoil starting with No. 1 blade using Colorbrite No. 2101 silver pencil or equivalent. No. 1 blade is located between X marks on rear face of 1st stage disk(3) blade slots.

(2) Remove 1st stage blades(5) from 1st stage disk(3) by moving adjacent blades out of disk a little at a time until all blades can be removed. Remove and discard 1st stage turbine rotor blade platform seals(4).

m. Remove 1st stage turbine disk and turbine front hub assembly from PWA 57830 stand and place on bench.



1. 1st stage turbine blade rear retaining plates
2. 1st stage turbine rotor seal
3. 1st stage turbine disk
4. 1st stage turbine rotor blade platform seals
5. 1st stage turbine rotor blades
6. Turbine front hub assembly

Figure 16. First Stage Turbine Duct and Support Set, 2nd Stage Turbine Vanes, and 2nd Stage Turbine Air Sealing Ring Assembly - Removal

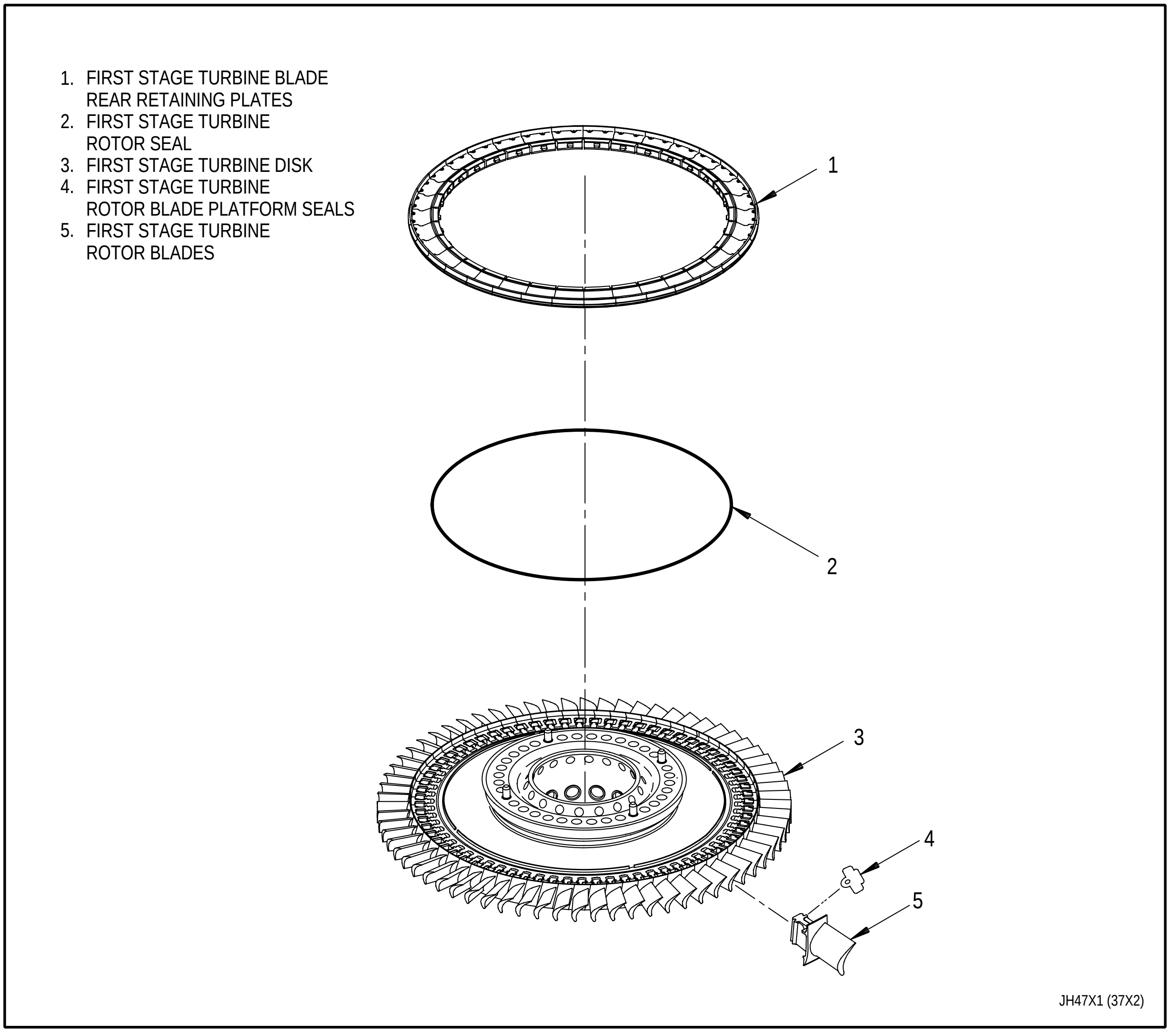


Figure 17. First Stage Turbine Blade Rear Retaining Plates and First State Turbine RotorBlades - Removal

n. Install PWA 57830 detail-23 ring(6, figure 18) onto base of PWA 57830 stand(8).

o. Lower 1st stage turbine disk and turbine front hub assembly front end up onto detail-23 ring(6).

p. Remove turbine front hub assembly(5) as follows:

(1) Thread detail-103 shaft(7) into base of stand(8).

(2) Lower detail-100 ring(3) onto front face of hub(5).

(3) Lower hydraulic cylinder assembly(2) onto detail-100 ring(3).

(4) Thread detail-9 nut(1) onto detail-103 shaft(7) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(5) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(6) Work PWA 55380 pump to separate hub(5) from 1st stage turbine disk(4). Do not exceed 5000 psig pressure.

(7) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(8) Remove detail-9 nut(1), hydraulic cylinder ring assembly(2), and detail-100 ring(3), and shaft(7).

(9) Remove 1st stage disk(4), and hub(5). Reinstall 1st stage disk(4) tierod flange down onto detail-23 ring(6). Reinstall shaft(7).

Legend for figure 18

1. Nut
2. Hydraulic cylinder assembly
3. Ring
4. First stage turbine disk
5. Turbine front hub assembly
6. Ring
7. Shaft
8. PWA 57830 stand

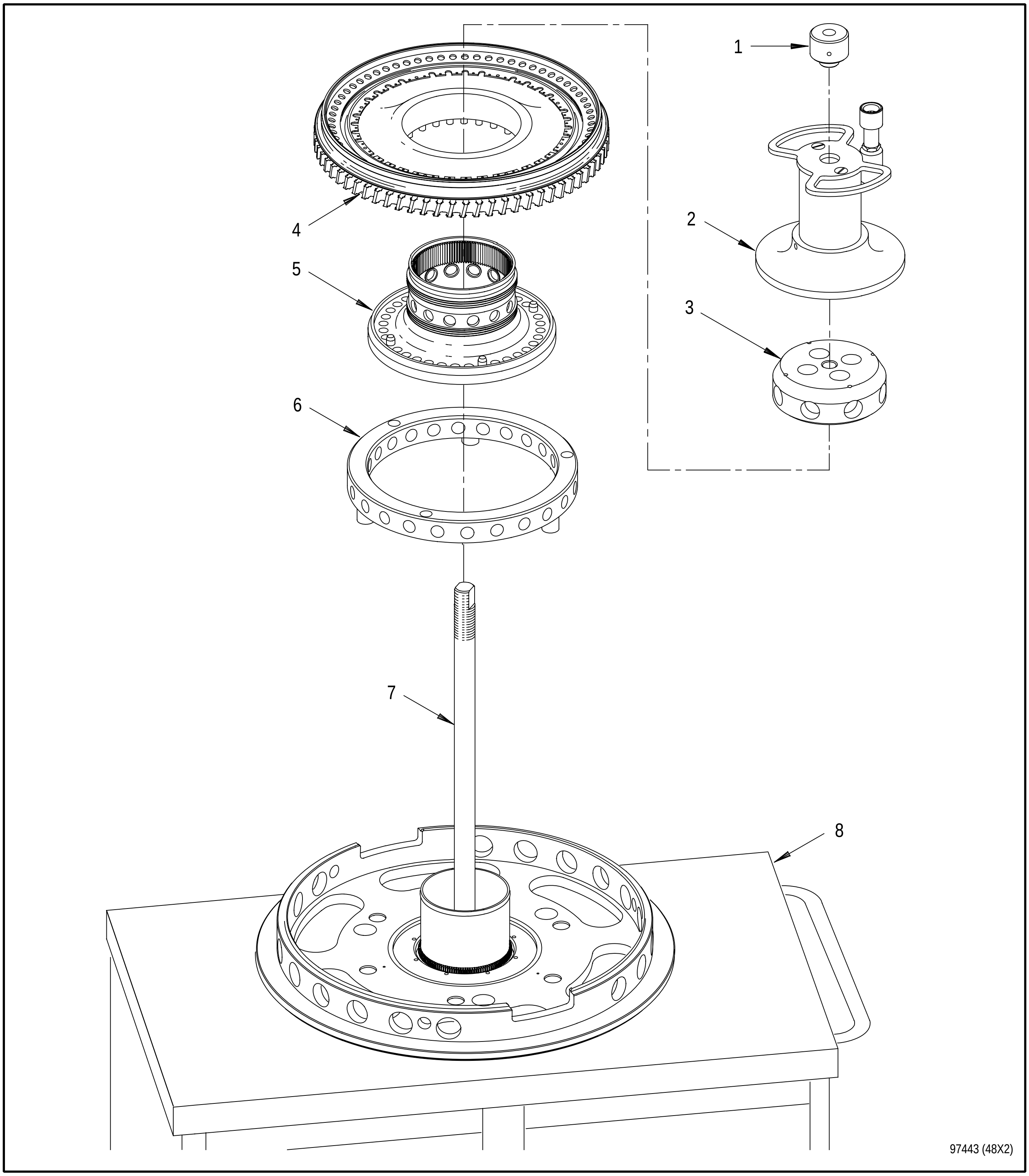


Figure 18. Turbine Front Hub Assembly - Removal

q. Remove 1st stage turbine air seal(9, figure 19) as follows:

NOTE

Crowfoot wrench NSN 5120-01-348-7323 (Snap On 5/16 inch Flank Drive crowfoot PN TMRX10) can be used without alteration for removal of rivet pins and nuts.

(1) Remove rivet pins and nuts(8 and 10) or bolts and nuts(8A and 10A) and discard.

(2) Drill out rivets(12) in counterweights(13) located on first stage turbine disk. Remove counterweights(13).

(3) Lower PWA 57830 detail-19 ring(7) onto 1st stage turbine disk(11).

(4) Lower detail-102 plate(6) onto detail-19 ring(7).

(5) Lower hydraulic cylinder assembly(5) onto detail-102 plate(6).

(6) Lower detail-97 ring assembly(2) onto hydraulic cylinder assembly(5).

(7) Install detail-27 jaws(3) through ring assembly(2) so that teeth of jaws engage flange of air seal(9). To facilitate installation of jaws, engage teeth at right end of jaw, then roll rest of jaw into place.

(8) Align jaws so that area where tooth is missing is located at scallops with rivet pin holes. Secure jaws to ring assembly(2) with cap screws(4).

(9) Thread detail-9 nut(1) onto shaft so that nut is two to three inches from hydraulic cylinder assembly(5).

(10) Connect PWA 55380 detail-103 pump to hydraulic cylinder assembly(5).

(11) Work PWA 55380 pump to unseat air seal(9). Do not exceed 5000 psig pressure.

(12) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

(13) Remove detail-9 nut(1), detail-27 jaws(3), detail-97 ring assembly(2), hydraulic cylinder assembly(5), detail-102 plate(6), and detail-19 ring(7). Remove air seal(9).

r. Remove turbine air seal spacer(5, figure 20) as follows:

(1) Lower PWA 57830 detail-28 ring assembly(4) onto 1st stage turbine blade front retaining plate(7).

Legend for figure 19

1. Nut
2. Ring assembly
3. Jaws
4. Cap screws
5. Hydraulic cylinder assembly
6. Plate
7. Ring
8. Rivet pins (0.164 inch)

8A. Bolts (0.190 inch)
9. First stage turbine air seal
10. Nuts (0.164 inch)
10A. Nuts (0.190 inch)
11. First stage turbine disk
12. Rivet
13. Counterweight

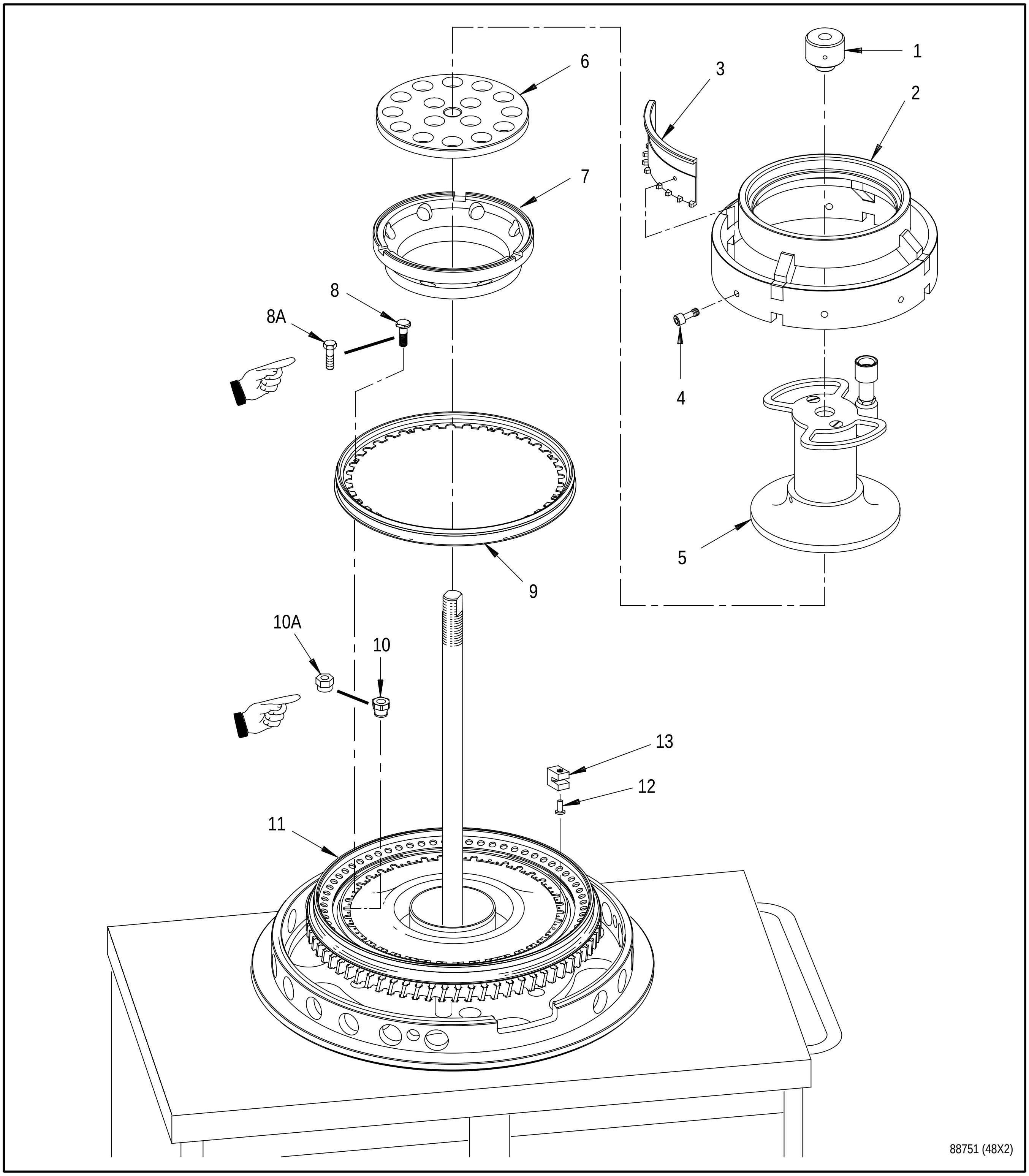


Figure 19.   First Stage Turbine Air Seal - Removal

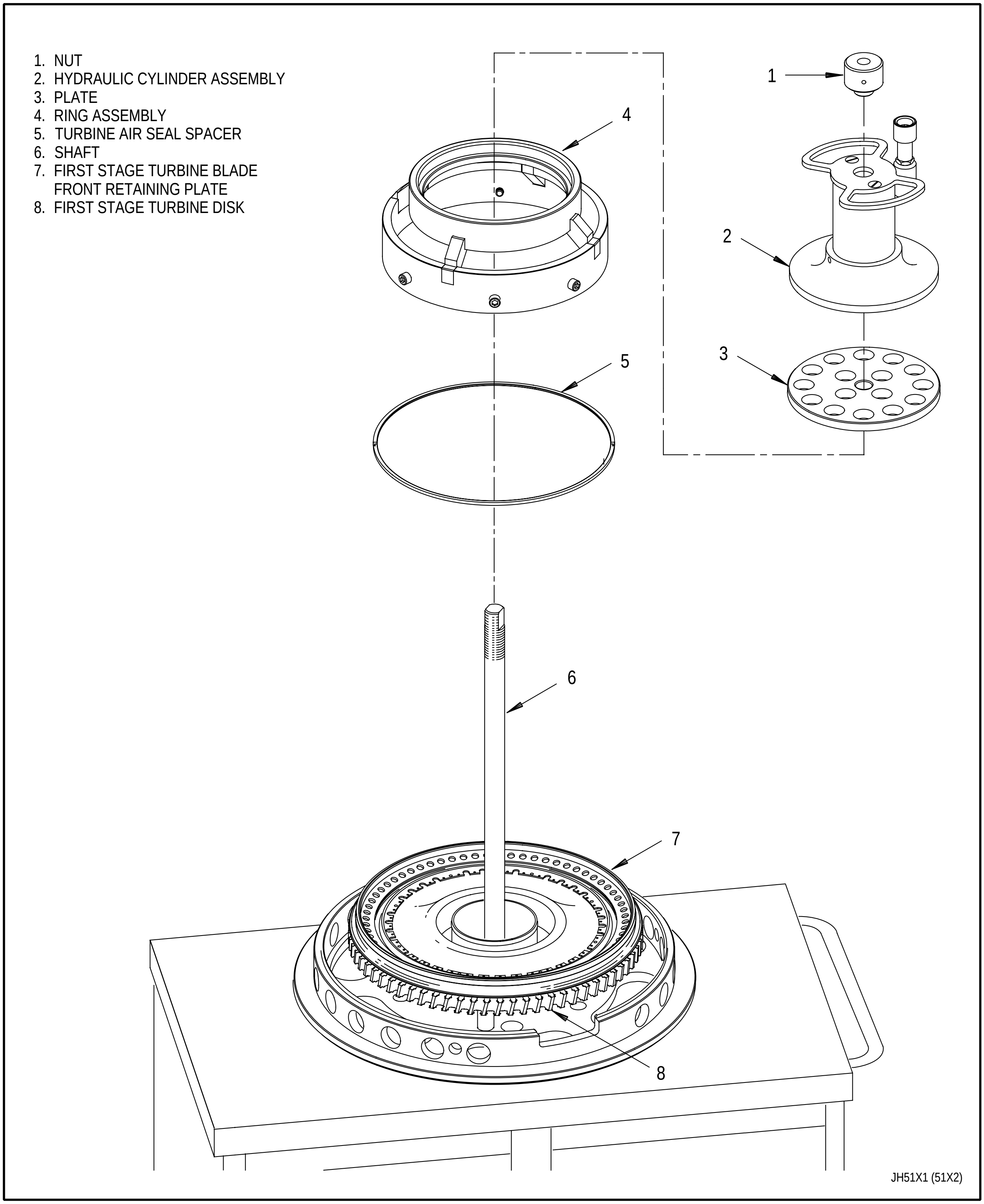


Figure 20. Turbine Air Seal Spacer - Removal

(2) Lower detail-102 plate(3) onto detail-28 ring assembly(4).

(3) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3).

(4) Thread detail-9 nut(1) onto detail-103 shaft(6), until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(5) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(6) Work PWA 55380 pump to depress retaining plate(7). Do not exceed 5000 psig pressure.

NOTE

Tapping ring assembly with a rubber mallet will help depress plate.

(7) Spread turbine air seal spacer(5), using PWA 53778 pliers, or equivalent, and remove spacer(5) from 1st stage turbine disk(8).

(8) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(9) Remove PWA 57830 detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-28 ring assembly(4). Remove air seal spacer(5).

s. Remove 1st stage turbine blade front retaining plate(8, figure 21) as follows:

(1) Lower PWA 57830 detail-19 ring(7) onto 1st stage turbine disk(11).

(2) Lower detail-102 plate(6) onto detail-19 ring(7).

(3) Lower hydraulic cylinder assembly(5) onto detail-102 plate(6).

(4) Attach detail-112 jaws(3) to detail-28 ring assembly(2). Secure with cap screws(4), but do not tighten cap screws at this time.

(5) Lower detail-28 ring assembly(2), with detail-112 jaws(3) attached, onto retaining plate(8) so that jaws engage puller groove in forward ID flange of retaining plate.

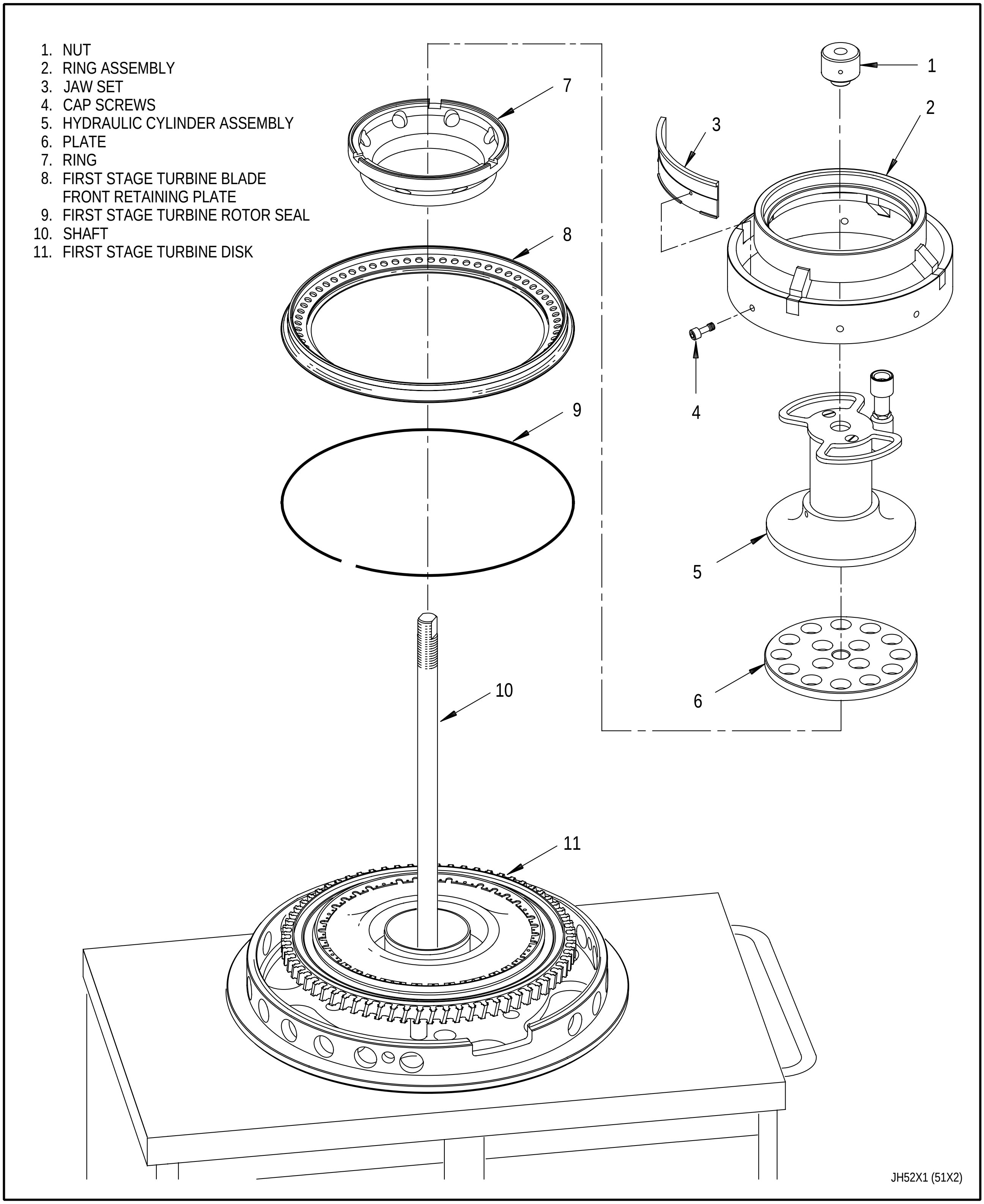


Figure 21. First Stage Turbine Blade Front Retaining Plate - Removal

(6) Tighten cap screws(4) to secure detail-112 jaws(3) to detail-28 ring assembly(2).

(7) Thread detail-9 nut(1) onto detail-103 shaft(10) so that nut is 2 to 3 inches from hydraulic cylinder assembly(5).

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

(9) Work PWA 55380 pump to remove retaining plate(8). Do not exceed 5000 psig pressure.

(10) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

(11) Remove detail-9 nut(1), detail-28 ring assembly(2), detail-29 jaw set(3), hydraulic cylinder assembly(5), detail-102 plate(6), detail-19 ring(7), and retaining plate(8). Remove 1st stage turbine rotor seal(9) from retaining plate(8). Discard seal(9).

(12) Remove 1st stage disk(11) from PWA 57830 stand and place on bench front end down.

(13) Remove ring(6, figure 18) from stand.

NOTE

- Two methods for tierod removal exist. One uses PWA 57908 support, the other uses PWA 57895 adapter set.
- Turbine tierod stretch measurement is required each time turbine is disassembled. This requirement applies even if turbine has not been run in an engine.

s1. Remove tierods using PWA 57908 support as follows:

(1) Release cam lever(7, figure 21A), block(5), locator(11), arm assembly(3), and post assembly(17) from PWA 57908 support.

(2) Secure PWA 57908 base(12) to work surface. Place locating ring(15), chamfered OD up, onto base and secure with socket head cap screws(13).

(3) Slide locating ring(14), chamfered OD up, over locating ring(15) until locating ring(14) contacts base.

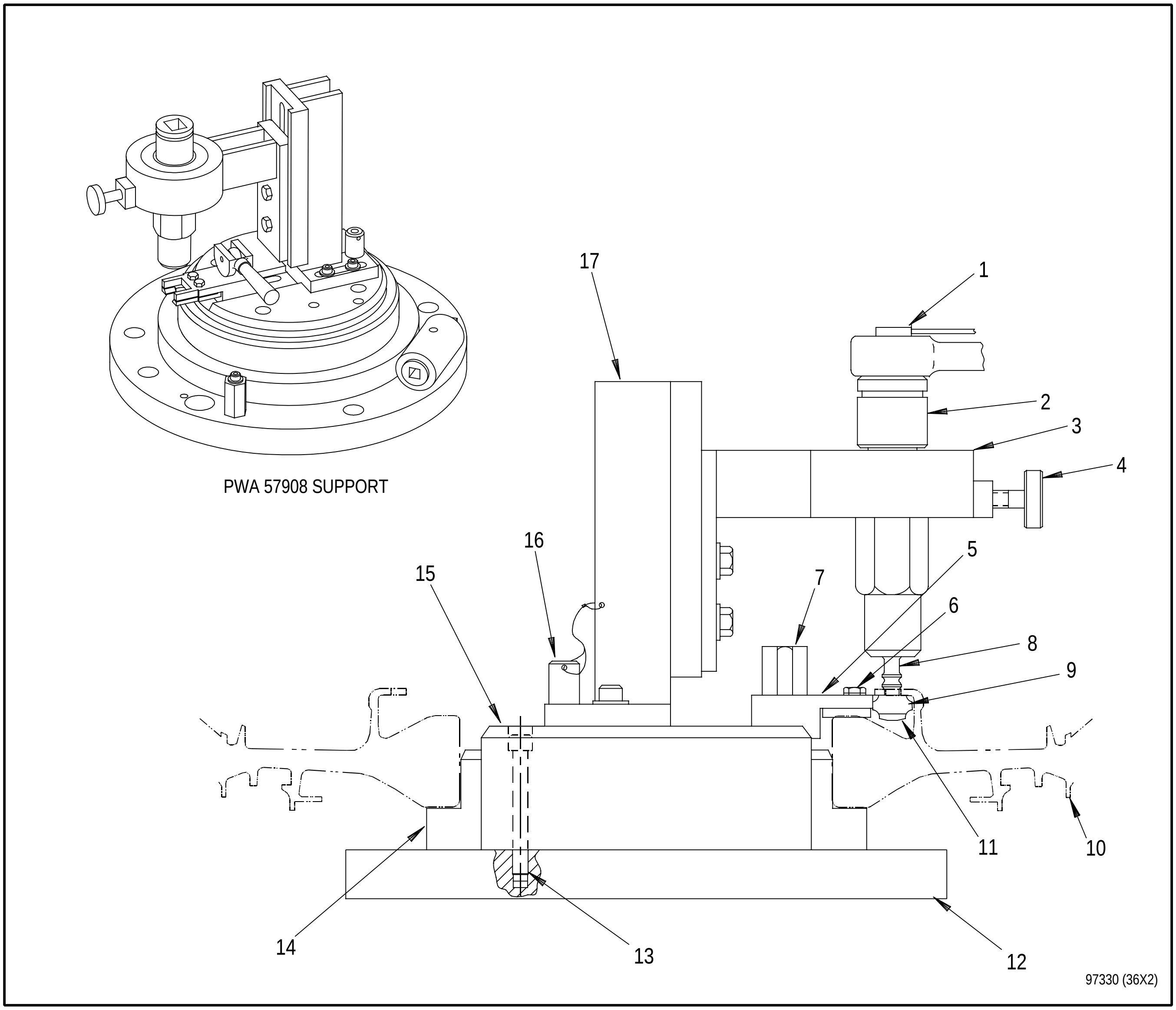
(4) Position 1st stage turbine disk assembly(10), tierod flange up, onto previously installed locating ring(14).

(5) Install block(5), and locator(11), as follows:

(a) Engage flats of block with flats of tierod nut(9) and engage locator(11) with cone shaped end of tierod(8).

(b) Secure block and locator together by tightening hex head screws(6).

(c) Actuate cam lever(7) to secure block position.



1. Torque wrench
2. Stud remover
3. Arm assembly
4. Thumbscrew
5. Block
6. Hex head screw
7. Cam lever
8. Tierod
9. Tierod nut
10. First stage turbine disk assembly
11. Locator
12. Base
13. Socket head cap screw
14. Locating ring
15. Locating ring
16. Pin assembly
17. Post assembly

Figure 21A. Tierods - Removal Using PWA 57908 Support

(6) Install post assembly(17) and arm assembly(3). Align post and arm with locating hole closest to center of base and insert pin assembly(16). Secure using hex head screws.

(7) Position arm assembly(3) to approximate height necessary to remove tierod(8). Secure with hex head screws.

(8) Loosen thumbscrew(4), and slide stud remover(2) in arm assembly(3). Secure by tightening thumbscrew(4).

(9) Loosen thumbscrew(4), and allow stud remover(2) to slide down and engage tierod.

(10) Insert drive of torque wrench(1) in top of stud remover(2) and remove tierod.

(11) Loosen cam lever(7) and slide block(5) and locator(11) away from tierod nut. Position 1st stage turbine disk assembly(10) to next tierod nut.

(12) Repeat procedure until all tierods have been removed.

(13) Remove tools from disk. Proceed to step t1.

t. Remove tierods using PWA 57895 adapter set as follows:

(1) Install detail-19 ring(7, figure 21) onto PWA 57830 stand so that end with smaller ID is facing up.

(2) Lower 1st stage turbine disk(6, figure 22) onto support with tierods facing up.

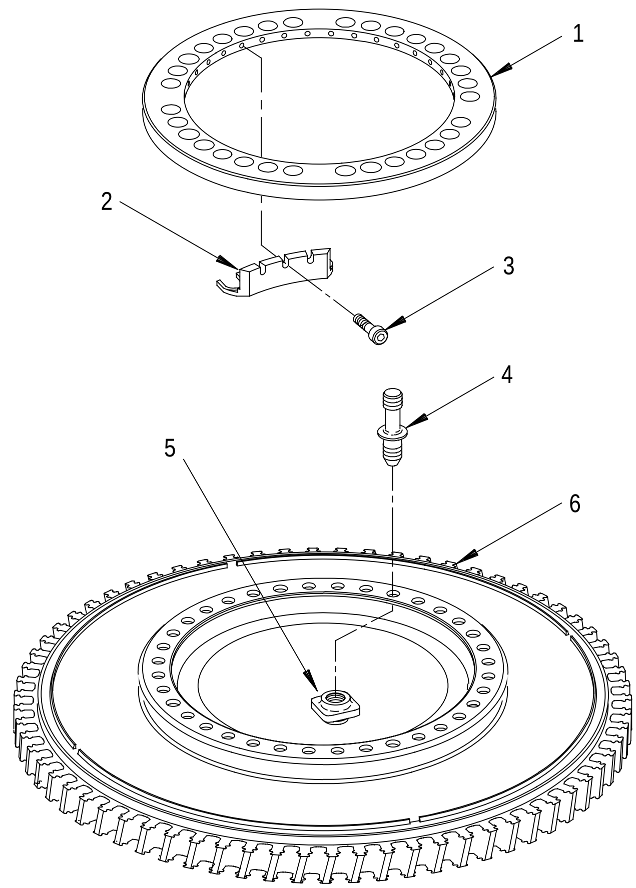
(3) Install PWA 57895 detail-3 nut holding assembly:

(a) Install segments(2) onto tierod nuts(5).

(b) Lift up segments(2) to ensure segments are properly installed.

(c) Install holding ring(1) over tierods.

(d) Secure segments(2) to ring(1) with cap screws(3).



1. Holding ring
2. Segments
3. Cap screws
4. Tierods
5. Tierod nuts
6. First stage turbine disk

Figure 22. Tierods - Removal Using PWA 57895 Adapter Set

(4) Remove tierods(4) (0.375-24 UNJF-3A thread size) using standard stud driver.

(5) Remove segments(2), nuts(5), and ring(1).

(6) Remove 1st stage disk(6) from PWA 57830 stand.

t1. Perform tierod stretch measurement per WP 313 00 each time tierods are removed from 1st stage disk.

u. If necessary, separate 2nd stage turbine blade retaining plate assembly(9, figure 23) from 2nd stage turbine disk(10) as follows:

(1) Install PWA 57830 detail-23 ring(11) onto base of stand(12).

(2) Place 2nd stage turbine disk(10) with turbine blade retaining plate assembly(9) onto detail-23 ring(11), tierod flange facing up.

(3) Thread detail-103 shaft(8) into base of stand(12).

(4) Lower detail-100 ring(7) onto turbine disk(10).

(5) Lower detail-102 plate(6) onto detail-100 ring(7).

(6) Lower hydraulic cylinder assembly(5) onto detail-102 plate(6).

(7) Lower detail-96 clamp assembly(2) onto hydraulic cylinder assembly(5).

NOTE

Lifting detail-25 clamp assembly(2) will facilitate installation of detail-25 jaw set(3).

(8) Install detail-25 jaw set(3) through detail-96 clamp assembly(2) so flange of jaw engages front flange ID of retaining plate(9). Secure jaw set(3) to clamp assembly(2) with cap screws(4).

(9) Thread detail-9 nut(1) onto detail-103 shaft(8) so nut is approximately 2 to 3 inches from hydraulic cylinder assembly(5).

(10) Connect PWA 55380 pump to hydraulic cylinder assembly(5).

(11) Work PWA 55380 pump to unseat retaining plate(9). Do not exceed 5000 psig pressure.

(12) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(5).

CAUTION

Take care not to damage air seals when removing retaining plate.

(13) Remove PWA 57830 detail-9 nut(1), detail-96 clamp assembly(2), detail-25 jaw set(3), hydraulic cylinder assembly(5), detail-100 ring(7), detail-102 plate(6), and detail-103 shaft(8). Remove retaining plate(9).

(14) Remove retaining plate damper(13).

Legend for figure 23

1. Nut
2. Clamp assembly
3. Jaw set
4. Cap screws
5. Hydraulic cylinder assembly
6. Plate
7. Ring
8. Shaft
9. Second stage turbine blade retaining plate assembly
10. Second stage turbine disk
11. Ring
12. PWA 57830 stand
13. Retaining plate damper

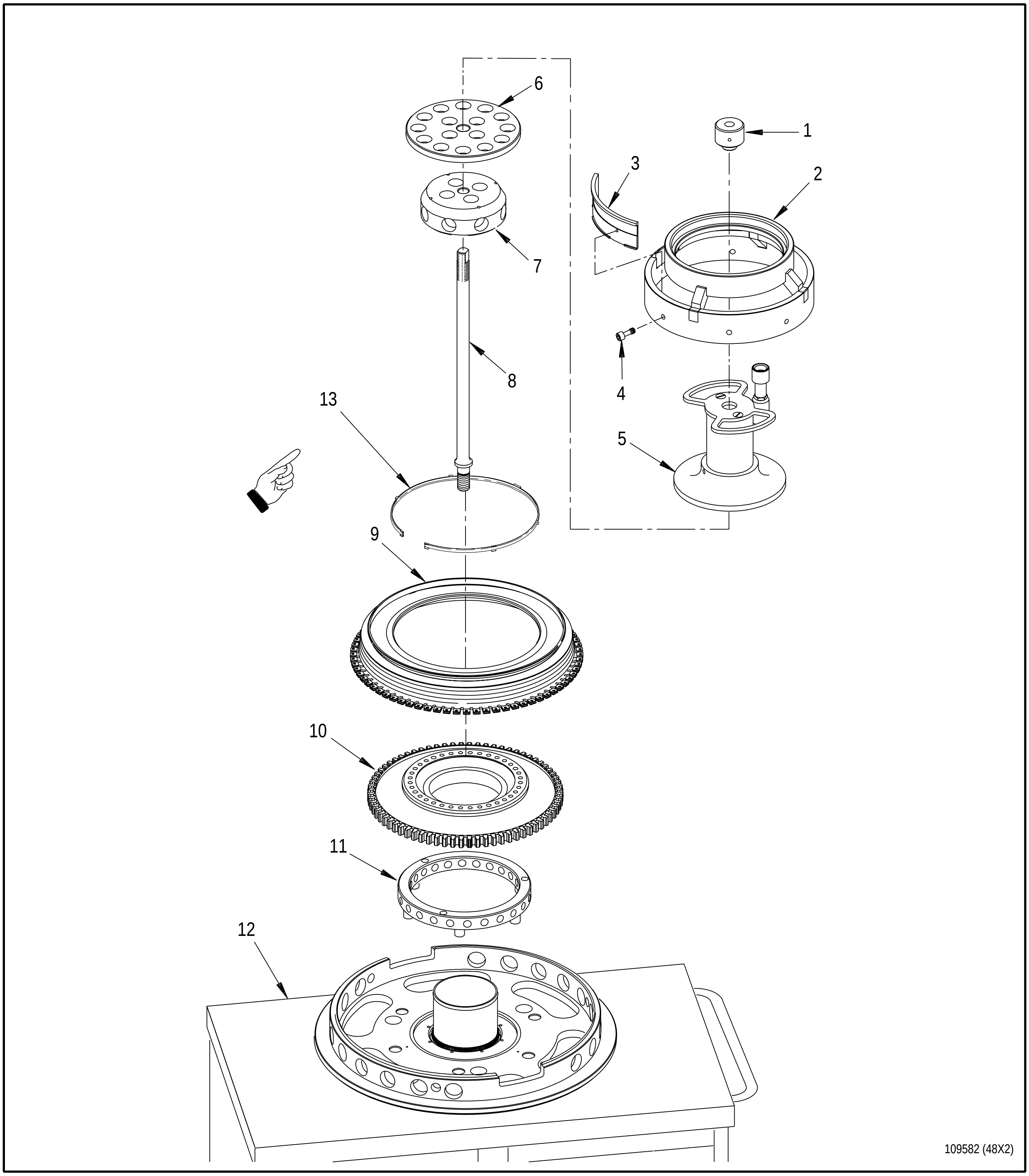


Figure 23. Second Stage Turbine Blade Retaining Plate Assembly - Removal From Second StageTurbine Disk

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

DISASSEMBLY OF SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.

This work package introduces the 020 00 through 199 00 series of work packages for disassembly of subassemblies for the rear compressor drive turbine rotor and stator assembly. The following work packages are included in this series:

WP No.	Title
021 00	Duct and Support Set, Turbine, First Stage; Vanes, Turbine Stator, Second Stage, and Ring Assembly - Air Sealing, Turbine, Second Stage - Disassembly
022 00	Rear Compressor Drive Turbine - Service Cycle Marking
023 00	Rear Compressor Drive Turbine Parts - Nondestructive Inspection Cycle Marking
024 00 through 199 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

DUCT AND SUPPORT SET - TURBINE, FIRST STAGE, VANES - TURBINE STATOR, SECOND STAGE, AND RING ASSEMBLY - AIR SEALING, TURBINE, SECOND STAGE -

DISASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23	3 - 4	19		

REFERENCE MATERIAL REQUIRED

None

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF CORE MODULE FEATURING ’97 ENHANCEMENT PACKAGE, F100--PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Pencil (crayon), silver, metal marking (hard)	Colorbrite 2101, Color-Tex 1843 or Anadel No. 1936

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Lockwire (0.032 inch diameter)	MS9226-04	As required

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for disassembly of the first stage turbine duct and support set, 2nd stage turbine stator vanes, and 2nd stage turbine air sealing ring assembly.

2. FIRST STAGE TURBINE DUCT AND SUPPORT SET, SECOND STAGE TURBINE STATOR VANES, AND SECOND STAGE TURBINE AIR SEALING RING ASSEMBLY - DISASSEMBLY.

(See Figure 1.)

a. Position 1st stage turbine duct and support set, 2nd stage turbine stator vanes, and 2nd stage turbine air sealing ring on bench, front end down.

NOTE

Stator seals(4 and 5, figure 1) in OD shroud between vanes may fall out as vanes are lifted from case.

b. Remove 2nd stage turbine stator vanes and air sealing ring(2) from 1st stage turbine duct and support set(1) as follows:

(1) Tap vanes(3), if required, to loosen from duct and support set(1). Use a fiber mallet to tap vanes.

(2) Grasp ID of air sealing ring and lift until outer shroud of vanes is visible.

(3) Secure double strand of lockwire around vanes outer diameter; then remove vane assembly from duct and support set and position on bench, front end down.

c. Cut lockwire retaining vanes. Remove seals(4 and 5) from vanes at sections where vanes join.

d. Remove vanes(3) from air sealing ring(6).

NOTE

Two first stage turbine duct and support set configurations exist. One set contains 18 segments, the other contains 36 segments.

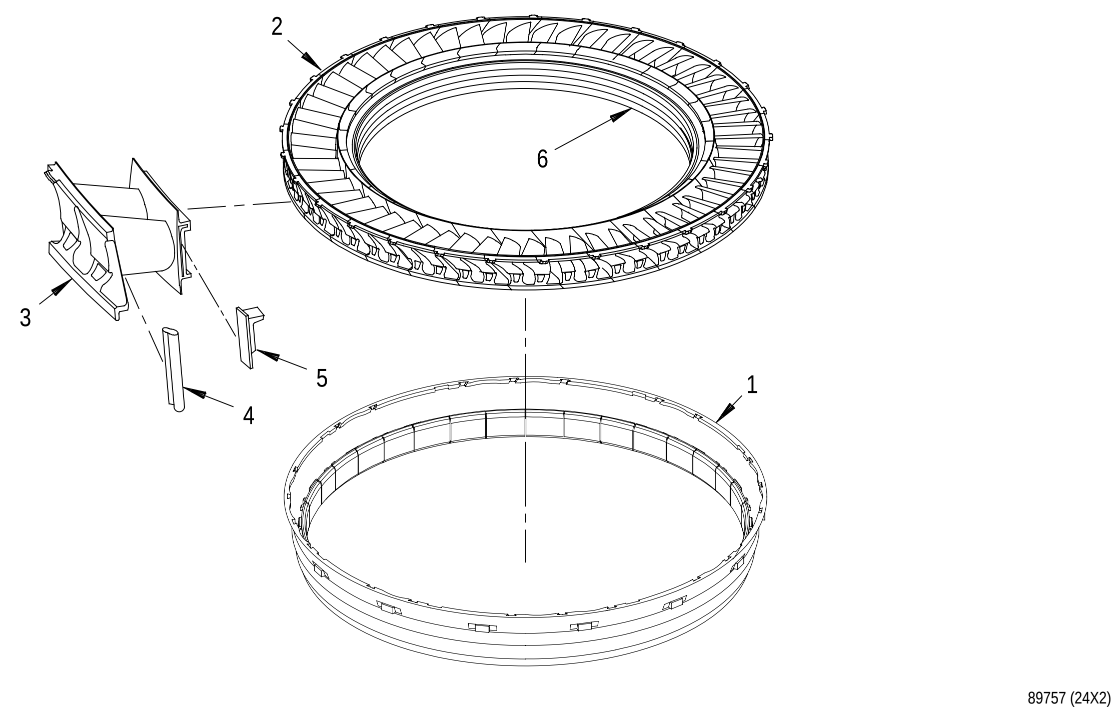
e. Disassemble first stage turbine duct and support set with 36 segments as follows:

NOTE

Twelve o’clock position of 1st stage turbine duct support is slot located between X-marks on face of rear flange.

(1) Number duct segments and adjacent support positions, 1 through 36, using Colorbrite No. 2101 silver pencil or equivalent. Start at 12 o’clock position, number in clockwise direction.

(2) Remove segments from support by tapping rearward using nylon or brass drift and hammer. It may be necessary to loosen adjacent segments to allow initial segment removal.



1. First stage turbine duct and support set
2. Second stage turbine air sealing ring and stator vanes
3. Second stage turbine stator vane assembly
4. Second stage turbine stator seal
5. Second stage turbine stator seal assembly
6. Air sealing ring

Figure 1. First Stage Turbine Duct and Support Set, Second Stage Turbine Stator Vanes, and Second Stage Turbine Air Sealing Ring Assembly - Disassembly

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE -

SERVICE CYCLE MARKING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - - - - - - - - - -	T.O. 2J-F100-53-1
Marking, General -	WP 022 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION

a. This work package contains instructions for Service Cycle Marking of rear compressor drive turbine blades and first stage turbine blade rear retaining plates.

2. REAR COMPRESSOR DRIVE TURBINE BLADES AND FIRST STAGE TURBINE BLADE REAR RETAINING PLATES - SERVICE CYCLE MARKING.

(See Figures 1 through 3 and Tables 1 and 2.)

NOTE

- Service Cycle Marking of parts shall be done immediately after removal. Parts shall not be removed solely for the purpose of marking cycles.
- Calculated Cycles (CCY) are obtainable from the high pressure turbine module AFTO 95 form. Parts should be marked so that the total number of CCY's accumulated since new are indicated with the appropriate cycle marking.
- If the cycle mark T (unknown) is on the blade root or retaining plate marking location, the part is assumed to have accumulated 4000 calculated cycles.

a. Mark Calculated Cycles (CCY) on all required parts when removed. Marking of new parts prior to installation into disk is not required.

b. Mark parts identified in table 1 as follows:

(1) Use controlled vibration peen method of marking. Do not exceed 0.006 inch depth. Refer to T.O. 2J-F100-53-1, WP 022 00.

(2) Ensure that code marking is legible. Provide space for maximum quantity of symbols to be marked. Use character size of 0.125 inch maximum. Do not allow markings to extend into radii, chamfers, sharp edges or fillets.

(3) Mark parts using codes established in table 2 so that addition of previously marked codes is not necessary, and total accumulated cycles shown is latest code marked on part. The T mark is not considered to have a cycle value when marking parts. See example blade No. 4 in table 2.

Table 1. Cycle Coding Configuration Chart

Nomenclature	Method of Marking	Location of Marking
1st stage turbine rotor blades	Vibration peening	Convex side of blade below platform. (See figure 1.)
2nd stage turbine rotor blades	Vibration peening	Convex side of blade below platform. (See figure 2.)
1st stage turbine blade rear retaining plates	Vibration peening	(See figure 3.)

Table 2. Cycle Marking Code

SYMBOL	CYCLES	SYMBOL	CYCLES	SYMBOL	CYCLES
◊	0 NEW	$\underline{\text{B}}$	1200 TO 1400	$\boxed{\text{C}}$	2800 TO 3000
T	UNKNOWN	$\vert\underline{\text{B}}$	1400 TO 1600	D	3000 TO 3200
A	0 TO 200	$\vert\underline{\text{B}}\vert$	1600 TO 1800	$\underline{\text{D}}$	3200 TO 3400
$\underline{\text{A}}$	200 TO 400	$\boxed{\text{B}}$	1800 TO 2000	$\vert\underline{\text{D}}$	3400 TO 3600
$\vert\underline{\text{A}}$	400 TO 600	C	2000 TO 2200	$\vert\underline{\text{D}}\vert$	3600 TO 3800
$\vert\underline{\text{A}}\vert$	600 TO 800	$\underline{\text{C}}$	2200 TO 2400	$\boxed{\text{D}}$	3800 TO 4000
$\boxed{\text{A}}$	800 TO 1000	$\vert\underline{\text{C}}$	2400 TO 2600		
B	1000 TO 1200	$\vert\underline{\text{C}}\vert$	2600 TO 2800		
CONTINUE IN LIKE MANNER WITH E, F, G, ... AS REQUIRED					

EXAMPLE OF SYMBOLS MARKED ON FOUR PARTS FROM DIFFERENT MODULES:

NOTE

1ST AND 2ND BLADES AND RETAINING PLATES WITH A T MARK ARE CONSIDERED TO HAVE 4000 CYCLES IN ADDITION TO ANY OTHER MARKED CYCLES.

PART NO. 1: ◊ $\vert\underline{\text{C}}$ = 2400 TO 2600 CYCLES
THIS PART HAD BEEN A NEW SPARE.

PART NO. 2: $\vert\underline{\text{A}}\vert$ $\vert\underline{\text{C}}$ = 2400 TO 2600 CYCLES
THIS PART HAD BEEN PREVIOUSLY MARKED AT 600 TO 800 CYCLE PERIOD.

PART NO. 3: T $\boxed{\text{B}}$ $\vert\underline{\text{C}}$ = AT LEAST 6400 TO 6600 CYCLES
THIS PART HAD BEEN A USED, SERVICEABLE PART OF UNKNOWN CYCLES WHEN FIRST INSTALLED. IT HAD ALSO BEEN REMOVED AND MARKED AT 1800 TO 2000 CYCLES PERIOD.

PART NO. 4: $\vert\underline{\text{A}}$ T $\vert\underline{\text{B}}$ = 5400 TO 5600 CYCLES (4000 ADDED TO 1400 TO 1600)
THIS PART WAS REMOVED AND MARKED AT THE 400 TO 600 CYCLE PERIOD. AT THE SECOND PART REMOVAL THE ADDITIONAL TIME ON THE PART COULD NOT BE DETERMINED AND THE PART WAS MARKED WITH A T AND INSTALLED. THIS PART WAS REMOVED AND MARKED 1000 CYCLES LATER.

JH56 (37X2)

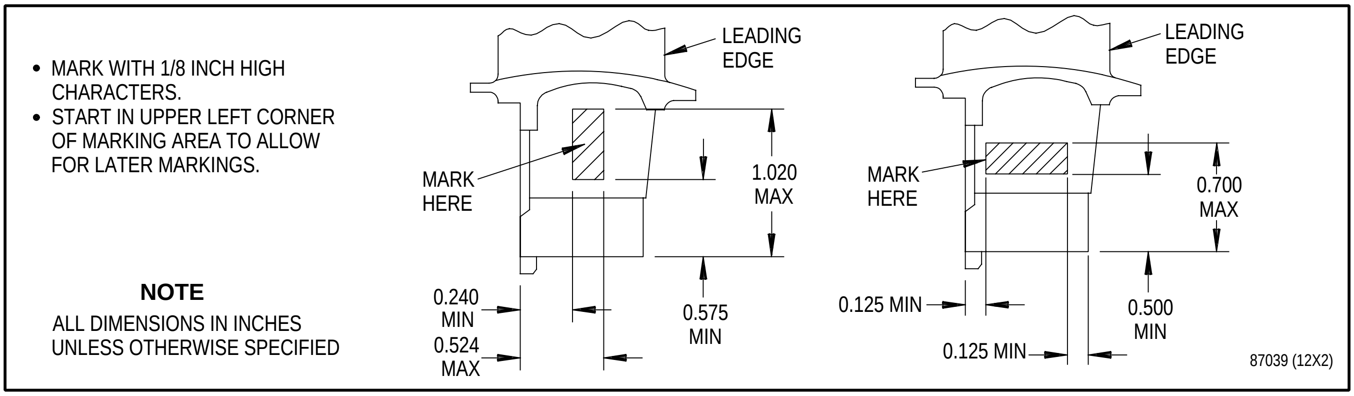


Figure 1. Service Cycle Marking of First Stage Turbine Blades

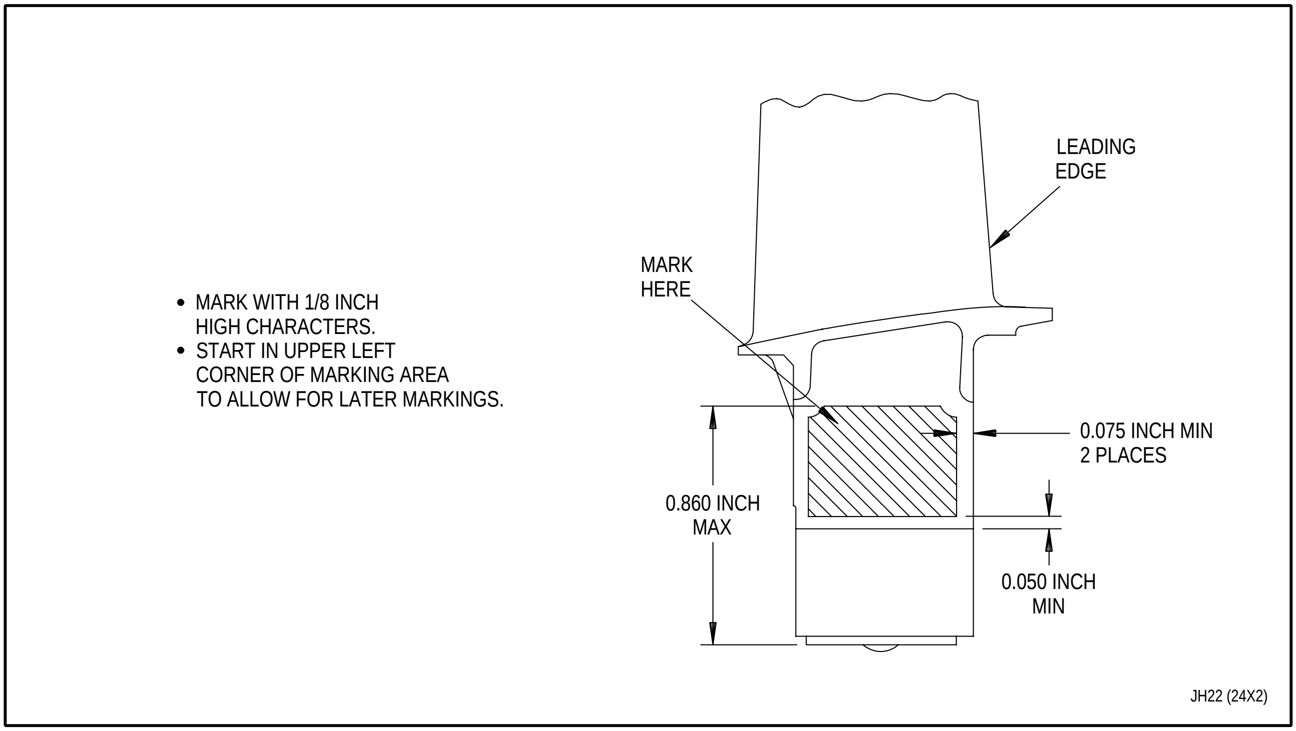


Figure 2. Service Cycle Marking of Second Stage Turbine Blades

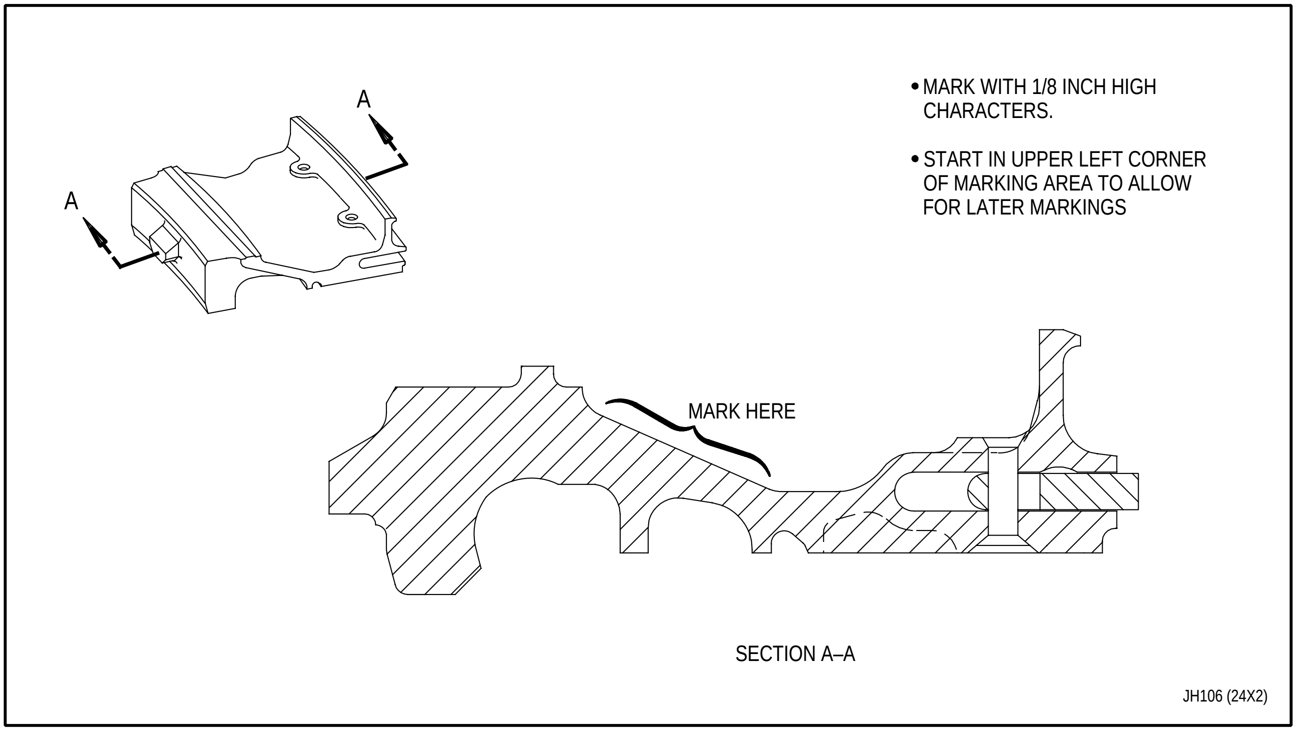


Figure 3. Service Cycle Marking of First Stage Turbine Rear Retaining Plate Assembly

NOTE

If cycle mark T (unknown) is on blade root or retaining plate marking location, the part is considered to have 4000 cycles in addition to any other marked cycles.

(4) If parts removed have been previously marked, determine Total Calculated Cycles (CCY) as follows:

(a) Cycles marked on part plus equivalent cycles accumulated since last installation for that wheel. Refer to part replacement record.

For Example:

First stage turbine blade in position No. 7 has code marked on blade root that reflects 600 to 800 cycles. According to rear compressor drive turbine records and to 1st stage turbine disk and blade assembly Historical Record, AFTO Form 44, total cycles on this assembly is presently 1300 cycles.
The AFTO Form 44 indicates blades were last installed when assembly had 400 cycles; therefore, 900 cycles have accumulated on blade No. 7 since last marking. (1300 - 400 = 900). Total cycles on blade No. 7 is at least 1500 but not more than 1700.

Minimum: 600 + 900 = 1500

average 1600

Maximum: 800 + 900 = 1700

Blade will be marked with B = 1600 - 1800

In above example, blade No. 7 was a used, serviceable blade (with 600 to 800 cycles) when installed in this particular turbine at the 400 cycle period.

(5) If parts removed are not marked, use Calculated Cycles (CCY).

c. Annotate appropriate AFTO No. 44 historical record with total Low Cycle Fatigue Cycles for both assembly and part with highest number of cycles. Parts identified in table 1 marked with a T are considered to have 4000 cycles in addition to any other marked cycles.

d. For turbine blade cycle marking, annotate each AFTO Form 44 disk and blade Historical Record just before installation of blades into disk as follows:

(1) Under installation data, record the following:

A. Activity accomplishing blade replacement

B. Rear Compressor Drive Turbine Serial No.

C. Date

D. Installation Time in Total Operating Hours

E.F.G. Record like C. and D.

H. Record Calculated Cycles (CCY)

I. Record HS I and HS II times from Engine History Recorder

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE PARTS -

NONDESTRUCTIVE INSPECTION CYCLE MARKING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 7	0				
8 Blank	0				

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - - - - - - - - - -	T.O. 2J-F100-53-1
Marking, General -	WP 023 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for nondestructive inspection cycle marking of 1st stage turbine disk, 2nd stage turbine disk, and 2nd stage turbine blade retaining plate assembly.

2. NONDESTRUCTIVE INSPECTION CYCLE MARKING.

(See Figures 1, 2, and 3.)

a. Mark part per T.O. 2J-F100-53-1, WP 023 00 and per figures 1, 2, and 3 after acceptable nondestructive inspection.

b. Ensure that code and numerical marking are legible, with maximum character size of 0.125 inch. Do not allow markings to extend into radii, chamfers, and sharp edges or fillets.

c. Marking for eddy current inspection parts will include the letters EC, followed by a number representing the total LCF cycles.

For example: EC 4000

This means that the inspected part has passed the required eddy current inspection at 4000 LCF cycles.

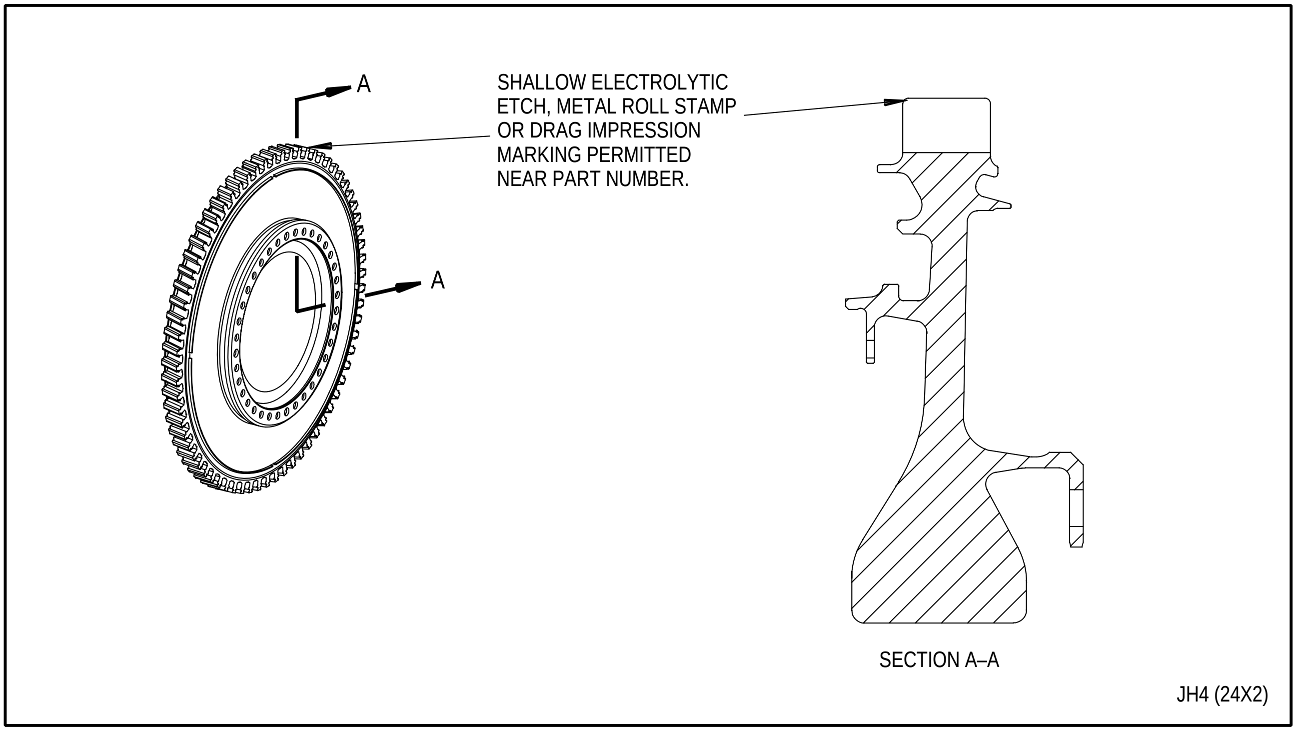


Figure 1. First Stage Turbine Disk - Marking

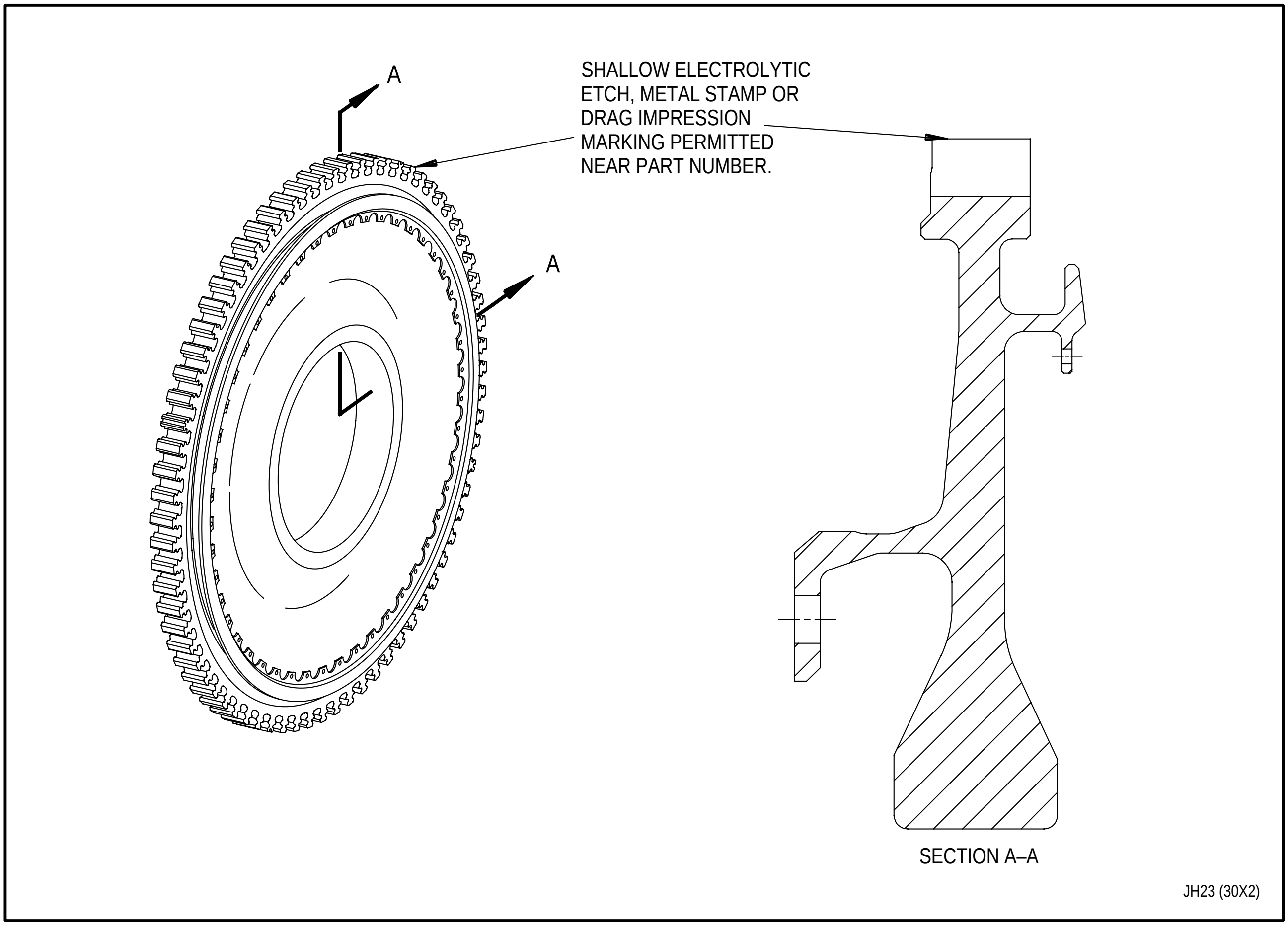


Figure 2. Second Stage Turbine Disk - Marking

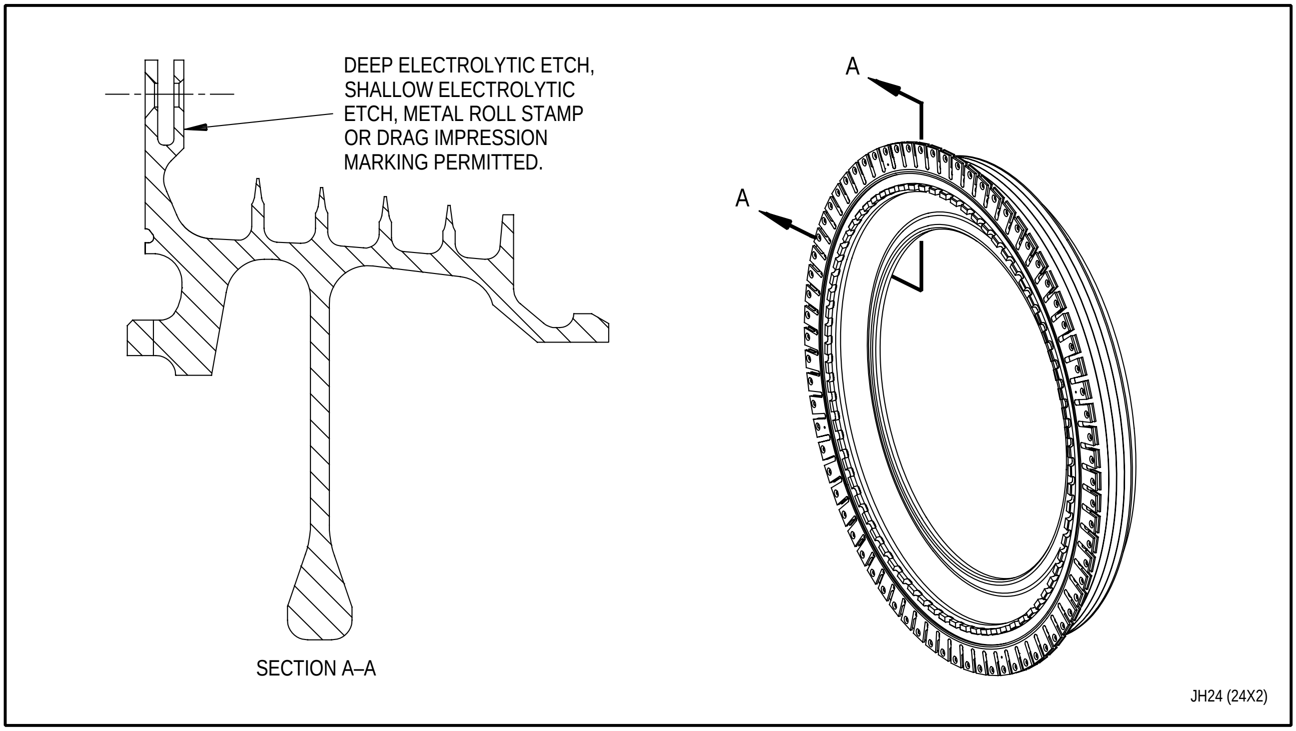


Figure 3. Second Stage Turbine Blade Retaining Plate Assembly - Marking

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE PARTS -

CLEANING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	10				

1. INTRODUCTION.

a. This work package introduces the 200 00 through 299 00 series of work packages for rear compressor drive turbine parts cleaning. The following work packages are included in this series:

WP No.	Title
201 00	Rear Compressor Drive Turbine Parts - Cleaning
202 00	Blade - Turbine Rotor, First Stage - Volcanic Ash Removal
203 00 through 299 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE PARTS -

CLEANING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	23	4	10	5	11
2	10	4A Added	11	6 - 7	0
3	0	4B Blank Added	11	8	23

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
Cleaning, Vapor Degreaser (SPOP 3)	SWP 031 01
Cleaning, Alkaline Rust Remover, Quick Soak (SPOP 18)	SWP 031 08
Cleaning, Alkaline Rust Remover, Long Soak (SPOP 203)	SWP 031 09
Cleaning, Wet Abrasive Blast (SPOP 9)	SWP 031 19
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Blade - Turbine Rotor, First Stage - Volcanic Ash Removal	WP 202 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains a table of all rear compressor drive turbine parts requiring cleaning. The table lists the part by name and part number, identifies the parent material, illustrates the part, lists any special cleaning instructions, and references the work packages where the cleaning procedures are described.

b. Recommended cleaning work package options for each part are listed in order of increasing severity. The primary purpose of cleaning is to prepare part for inspection. Select the least severe process for this purpose, based on operator’s experience. Proceed to a more severe process only if required for effective results.

2. REAR COMPRESSOR DRIVE TURBINE - PARTS CLEANING.
(See Table 1.)

Table 1. Rear Compressor Drive Turbine - Parts Cleaning

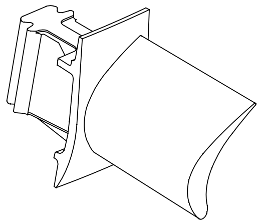
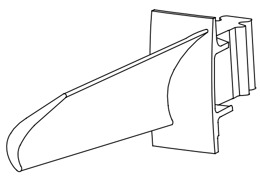
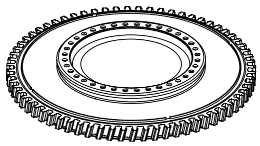
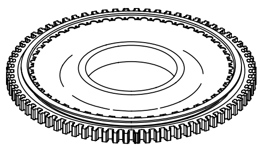
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Blade - turbine rotor, 1st stage	 **PN 4070801 PWA 1484 Nickel Alloy**	Remove volcanic ash deposits from air foil surfaces and cooling holes per WP 202 00.	SWP 031 01, SWP 031 09, SWP 031 19
Blade - turbine rotor, 2nd stage	 **PN 4070292 PWA 1484 Nickel Alloy**		SWP 031 01, SWP 031 09, SWP 031 19
Disk - turbine, 1st stage	 **PN 4069901 PWA 1106 Nickel Alloy**		SWP 031 01, SWP 031 09
Disk turbine, 2nd stage	 **PN 4069902 PWA 1106 Nickel Alloy**		SWP 031 01, SWP 031 09

Table 1. Rear Compressor Drive Turbine - Parts Cleaning (continued)

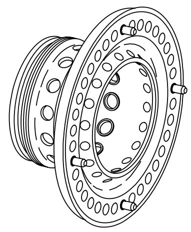
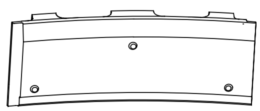
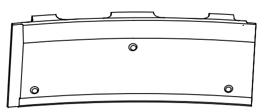
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Hub Assembly, Turbine Front	 PN 4069333 -C **PN 4069333 PWA 1106 Nickel Alloy**		SWP 031 01, SWP 031 09
Duct segment - turbine, 1st stage	 PN 4076206 -C **PN 4082503 PWA 1487 Nickel Alloy**		SWP 031 01, SWP 031 09, SWP 031 19
Duct segment - turbine, 1st stage	 PN 4076206 -C **PN 4082861 PWA 1484 Nickel Alloy**		SWP 031 01, SWP 031 09, SWP 031 19

Table 1. Rear Compressor Drive Turbine - Parts Cleaning (continued)

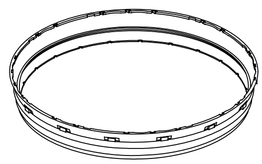
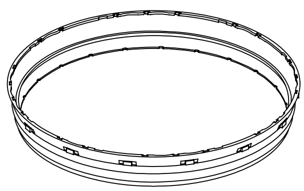
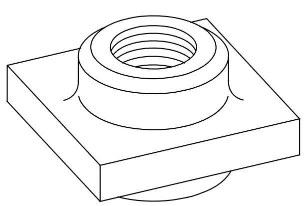
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Support - turbine duct and vane	 **PN 4079857 PWA 1192 Iron/Nickel Alloy**		SWP 031 01, SWP 031 09, SWP 031 19
Support - turbine duct and vane	 **PN 4082863 PWA 1198 Nickel Alloy**		SWP 031 01, SWP 031 09, SWP 031 19
Nut - tierod	 **PN 4071798 AMS 5709 Nickel Alloy**		SWP 031 01, SWP 031 09

Table 1. Rear Compressor Drive Turbine - Parts Cleaning (continued)

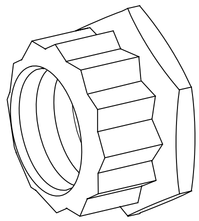
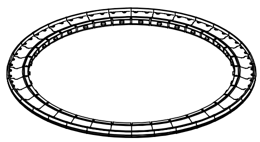
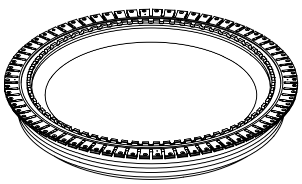
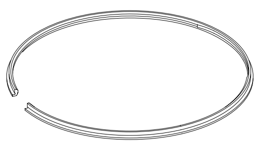
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Nut - tierod	 PN 4069047 –C **PN 4069047** **AMS 5709** **Nickel Alloy**		SWP 031 01, SWP 031 09
Plate assembly - retaining, blade, turbine, rear, 1st stage	 PN 4071355 -C **PN 4071355** **PWA 658** **Nickel Alloy**		SWP 031 09
Plate - rear retaining, blade, turbine, 2nd stage	 PN 4069989 –C **PN 4067068** **PN 4069989** **PWA 1106** **Nickel Alloy**		SWP 031 01, SWP 031 09
Ring - turbine blade retaining plate	 PN 4060966 –C **PN 4060966** **PWA 5707** **Nickel Alloy**		SWP 031 01, SWP 031 09

Table 1. Rear Compressor Drive Turbine - Parts Cleaning (continued)

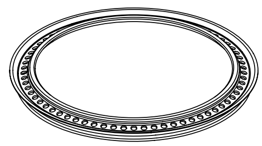
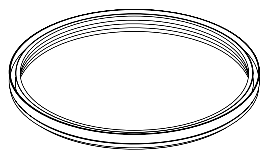
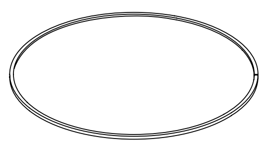
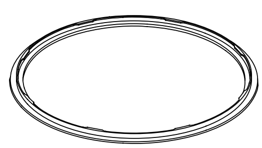
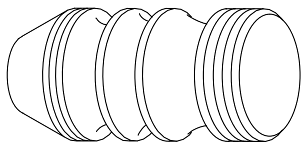
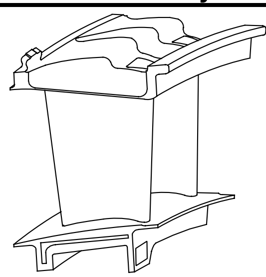
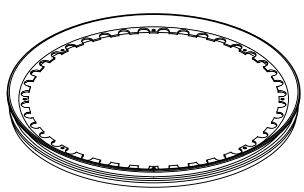
Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Plate - retaining, blade turbine, front, 1st stage	 PN 4069990 -C **PN 4069990** **PWA 1106** **Nickel Alloy**		SWP 031 01, SWP 031 09
Ring assembly - air sealing, turbine 2nd stage	 PN 4063436 –C **PN 4063436** **PWA 5607** **Nickel Alloy**		SWP 031 08, SWP 031 19
Spacer - turbine air seal	 PN 4061748 -C **PN 4061748** **PWA 5707** **Nickel Alloy**		SWP 031 01, SWP 031 09
Plate - retaining blade, turbine, rear, 2nd stage	 PN 4061632 -C **PN 4061632** **PWA 1016** **Nickel Alloy**		SWP 031 01, SWP 031 09

Table 1. Rear Compressor Drive Turbine - Parts Cleaning (continued)

Part Name	Illustration Typical Part Number and Parent Material	Special Cleaning Instructions	Cleaning WP/SWP Reference T.O. 2J-F100-53-1
Tierods - turbine (1st to 2nd stage)	 PN 4071799 -C PN 4071799 PWA 92 Nickel Alloy		SWP 031 01, SWP 031 09
Vane assembly - turbine stator, second stage	 PN 4072682 -C PN 4072682 PN 4079932 PWA 1484 Nickel Alloy		SWP 031 01, SWP 031 09
Seal assembly - turbine first stage	 PN 4080429 –C PN 4080429 PN 4083238 PWA 1106 Nickel Alloy		SWP 031 01, SWP 031 09

WORK PACKAGE

TECHNICAL PROCEDURES

BLADE - TURBINE ROTOR, FIRST STAGE -

VOLCANIC ASH REMOVAL

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Introduction and General Information	T.O. 2J-F100-53-1
General Cleaning Procedure - Cleaning, Grit Blast, Dry (SPOP 218)	SWP 031 13
Approved Source List	WP 608 00
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
First Stage Turbine Rotor Blade - Inspection	WP 303 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

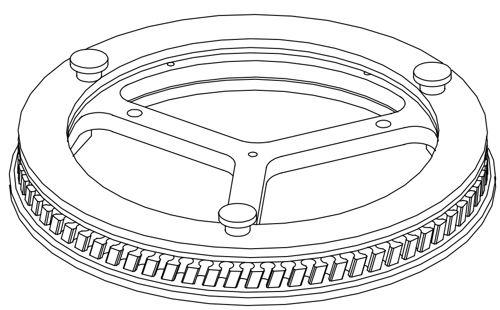
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	First Stage Turbine Blades - PWA 275 Coating Cleaning and Inspection	
	Fixture, Holding, 1st stage turbine blades	PWA 70788

ILLUSTRATED SUPPORT EQUIPMENT



PWA 70788 –C

Figure T1. PWA 70788 Fixture

1. INTRODUCTION.

a. This work package contains special cleaning and inspection instructions for 1st stage turbine blades having volcanic ash deposits on airfoil surfaces and in cooling holes.

2. FIRST STAGE TURBINE BLADES - PWA 275 COATING CLEANING AND INSPECTION.

(See Figure 1.)

a. Clean blades per SPOP 209. Refer to T.O. 2-1-111.

b. Visually inspect blades to verify volcanic ash deposits on airfoil surfaces or in cooling holes.

NOTE

Water jet cleaning of turbine airfoils is a SA-ALC source qualified procedure. Refer to T.O. 2J-F100-53-1, WP 608 00 for SA-ALC procedure numbers and additional qualified sources.

c. Water jet clean blades as follows:

(1) Install blades into PWA 70788 holding fixture.

(2) Perform water jet cleaning operations using parameters as controlled by approved procedures.

(3) Remove blades from PWA 70788 holding fixture.

(4) Blow dry using compressed air.

CAUTION

Do not dwell blast on any surface or damaging coating loss will result.

NOTE

After grit blast and heat tint, blades shall be handled using clean gloves.

d. Dry grit blast airfoil surfaces lightly per SPOP 218 using 240 mesh grit or finer. Refer to T.O. 2J-F100-53-1, SWP 031 13. Do not grit blast blade root area. See figure 1.

e. Heat tint and inspect blades as follows:

(1) Load grit blasted blades into clean air circulating furnace and heat tint at 1050 to 1100°F (566 to 593°C) for 50 to 70 minutes.

(2) Allow blades to cool and compare coating results to those on PWA 31383 in T.O. 2-1-111 and the following special inspection criteria:

(a) Visual inspection shall occur within 14 hours after heat tint operation.

(b) Golden or pewter color indicates presence of aluminide coating.

(c) Blue or purple color indicates absence of coating and is not permitted on airfoil surfaces.

(d) Residual volcanic ash is denoted by dark brown colored areas that appear to be slightly raised above surrounding surfaces. Volcanic ash deposits on airfoil surfaces and trailing edge slots are permissible provided they do not block airfoil cooling passages. See figure 1.

(3) If residual ash remains in cooling holes, water jet clean one additional cycle beginning at step c. Two complete cleaning cycles allowed for each blade.

f. Inspect all other blade areas per WP 303 00.

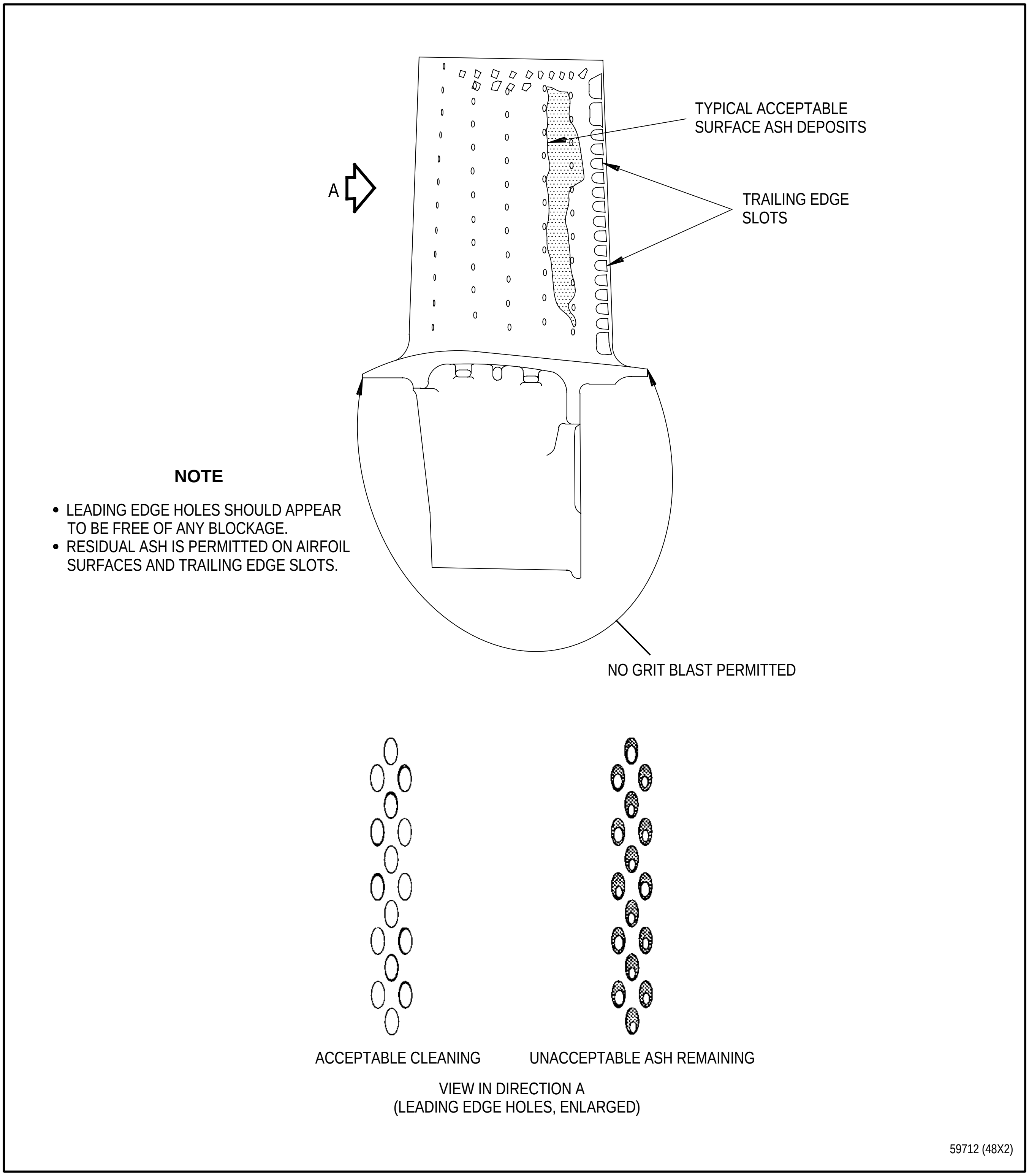


Figure 1. First Stage Turbine Blades - Water Jet Cleaning

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	15				

1. INTRODUCTION.

a. This work package introduces 300 00 through 399 00 series of work packages for inspection of rear compressor drive turbine. The following work packages are included in this series:

WP No.	Title
301 00	Seal - Air, Turbine, First Stage - Inspection
302 00	Plate - Retaining, Blade, Turbine, Front, First Stage - Inspection
303 00	Blade - Turbine Rotor, First Stage - Inspection
304 00	Disk - Turbine, First Stage - Inspection
305 00	Plate Assembly - Retaining, Blade, Turbine Rear, First Stage - Inspection
306 00	Duct and Support Set - Turbine, First Stage - Inspection
307 00	Ring Assembly - Air Sealing, Turbine, Second Stage - Inspection
308 00	Vane - Turbine Stator, Second Stage - Inspection
309 00	Plate Assembly - Retaining, Blade, Turbine, Second Stage - Inspection
310 00	Blade - Turbine Rotor, Second Stage - Inspection
311 00	Disk - Turbine, Second Stage - Inspection
312 00	Plate, - Retaining, Blade, Turbine, Rear, Second Stage - Inspection
313 00	Tierod - Turbine - Inspection
314 00	Hub Assembly - Turbine, Front - Inspection
315 00	Ring - Turbine Blade Retaining Plate - Inspection
316 00	Spacer - Turbine Air Seal - Inspection
317 00	Damper - Turbine Blade Retaining Plate - Inspection
318 00	Blades - Turbine Rotor, First and Second Stage - Moment-Weight Classification
319 00	Vane - Turbine Stator, Second Stage - Airflow Check
320 00	Blades and Vanes, Turbine, PWA 73 or PWA 275 Coating - Cleaning and Inspection
321 00 through 399 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

SEAL - AIR, TURBINE, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	23	5	23	7 Added	16
4A Added	23	6	16	8 Blank Added	16
4B Blank Added	23				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Seal - Air, Turbine, First Stage Repair	WP 401 00
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 1st stage turbine air seal (2 and 3 knife edge configuration).

2. FIRST STAGE TURBINE AIR SEAL - INSPECTION.

(See Figure 1, 1A, 2 and 3.)

a. Ensure that first stage turbine air seal has been cleaned per WP 201 00.

b. See figure 1 for visual and dimensional inspection limits.

c. Fluorescent penetrant inspect first stage turbine air seal for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed. All crack indications observed at inspection are cause for rejection and require Material Review Board (MRB) evaluation, see figure 2. Refer to T.O. 2J-F100-9.

d. Eddy current inspect first stage turbine air seal per requirements of figure 3. Refer to T.O. 2J-F100-9

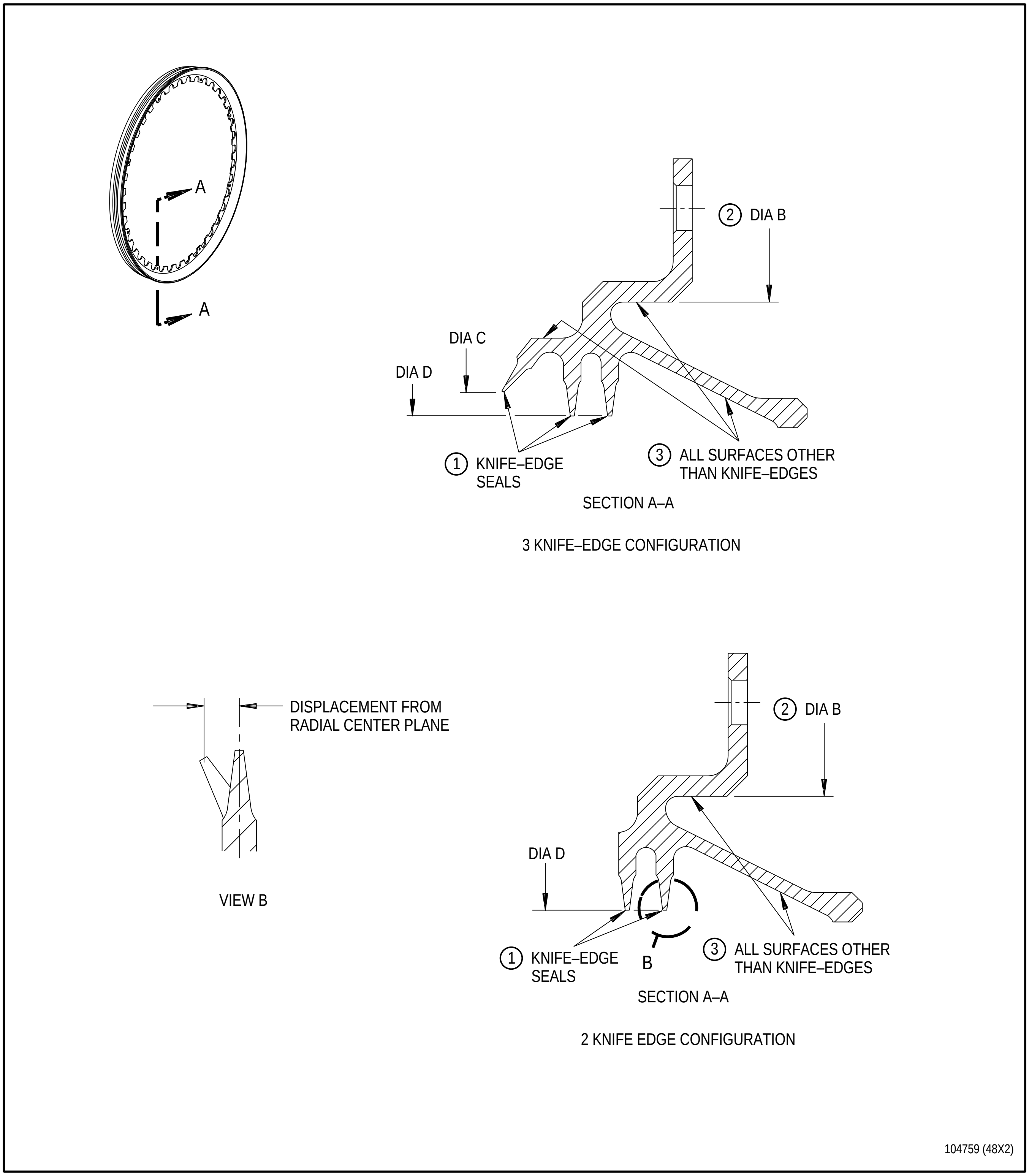


Figure 1. First Stage Turbine Air Seal - Inspection

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Knife-edge seals -			
Wear	Average minimum serviceable diameters: Diameter C 14.676 inches, Diameter D 14.878 inches	Average minimum reparable diameters: Diameter C 14.668 inches, Diameter D 14.870 inches	Strip and recoat per WP 401 00.
Bent	0.500 inch in length per knife-edge. 0.050 inch maximum displacement from radial center plane.	Damage is reparable if the final blend meets the blend limits in WP 401 00	Blend repair per WP 401 00.
Chipped or missing coating	Visible as lost top coating missing from bond coat layer by defined lines of demarcation. See figure 1A. Coating may be chipped or missing in up to six 0.250 inch long areas, but shall be separated by at least one inch per knife edge.	Any amount	Strip and recoat per WP 401 00.
Nicks and dents	Not serviceable	Damage is reparable if the final blend meets the blend limits in WP 401 00	Blend repair per WP 401 00.
Cracks	Not serviceable	Not reparable	Replace air seal.
2. Diameter B -			
Wear	13.987 to 13.991 inch diameter	Not reparable	Replace air seal.
3. All surfaces other than knife-edges -			
Dents, nicks, scratches	Not serviceable	Any amount	Replace air seal.

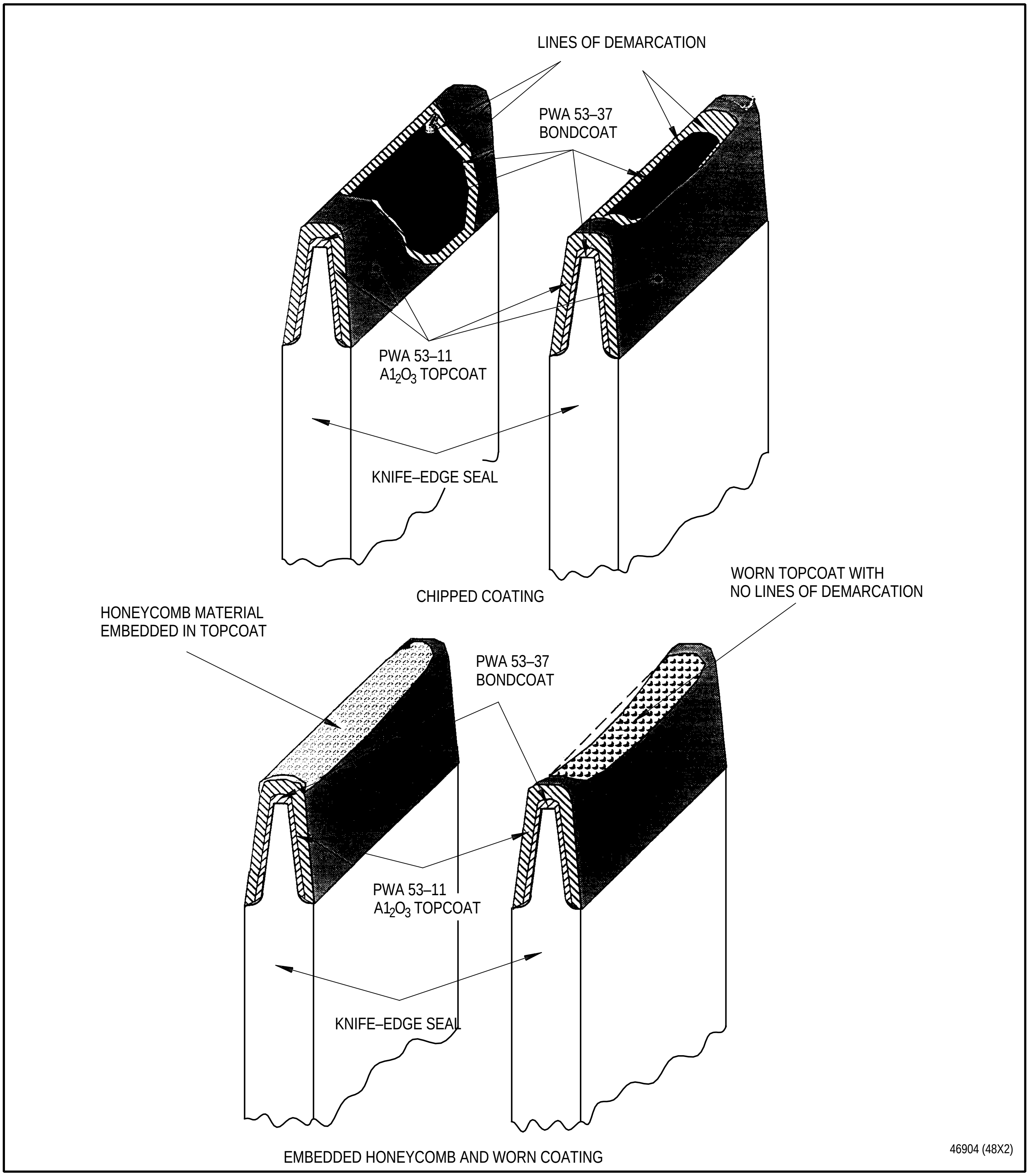


Figure 1A. First Stage Turbine Air Seal - Chipped Coating, Embedded Honeycomb, and Worn Coating

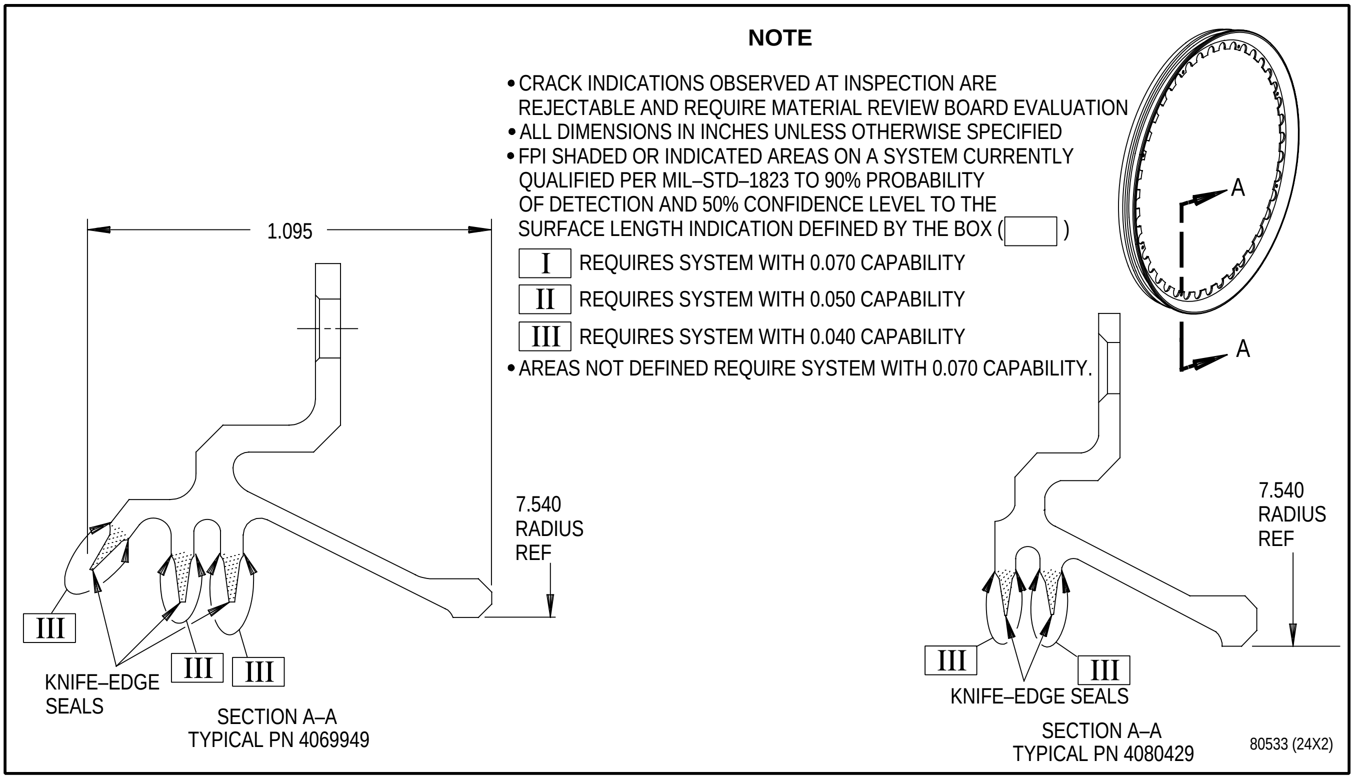
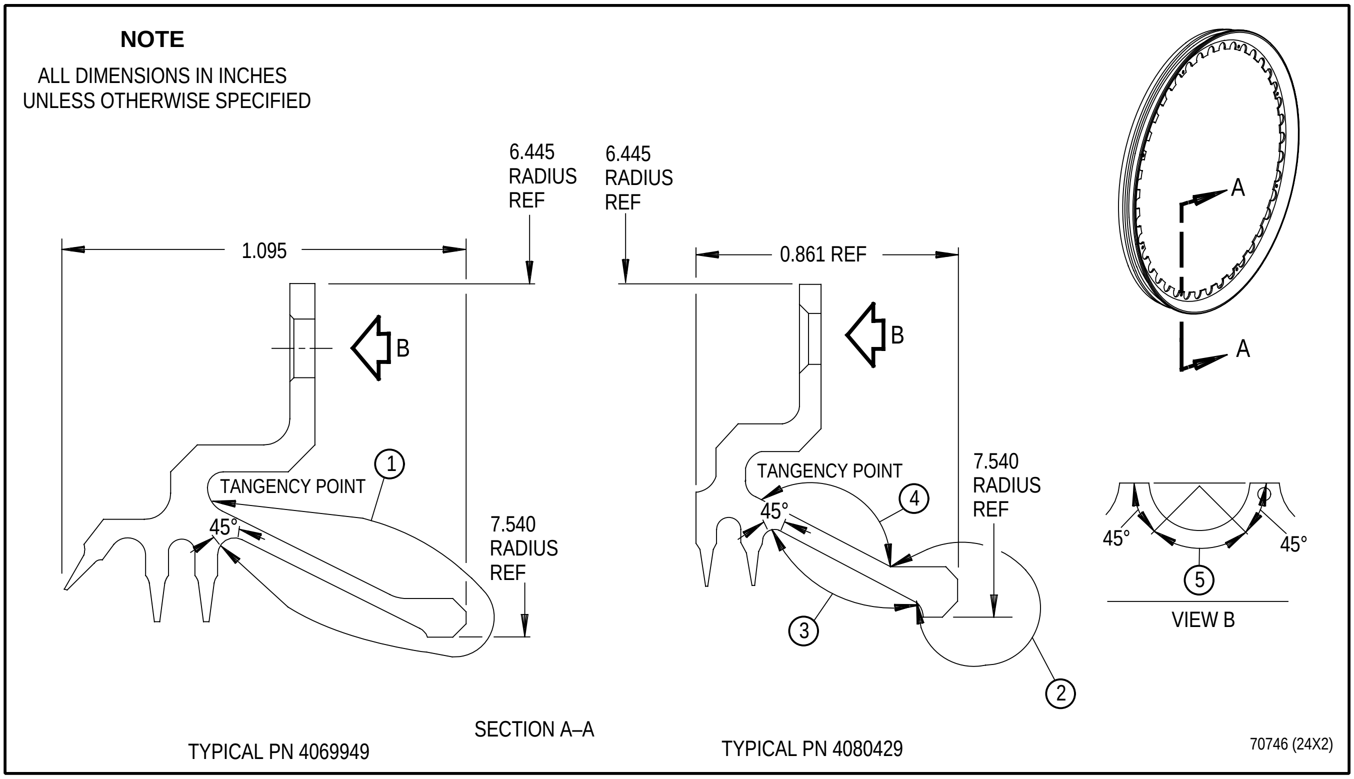


Figure 2. First Stage Turbine Air Seal - Required Fluorescent Penetrant System Capability



Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	SRL System rejection Limits (Counts)	SRL System rejection Limits (A50-Inch)	Corrective Action
1. Surface	0.005	Axial Radial	TBD	TBD	Replace air seal.
2. OD edge	0.010	Axial Radial	TBD	TBD	Replace air seal.
3. Surface	0.008	Axial	TBD	TBD	Replace air seal.
4. Surface	0.008	Axial	TBD	TBD	Replace air seal.
5. Scallops, 32 places	0.005	Axial	TBD	TBD	Replace air seal.

*Eddy current inspect on system currently qualified per MIL-STD-1823 at 90% probability of detection and 50% confidence level for required flaw depth.

FIgure 3. First Stage Turbine Air Seal - Eddy Current Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE - RETAINING, BLADE, TURBINE, FRONT, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	27	4A Added	23	5	23
4	23	4B Blank Added	23	6 - 8	27

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Nondestructive Inspections - General Information	SWP 004 01
Nondestructive Inspection Procedure (Repetitive) - Eddy Current	SWP 004 09
Plate, Retaining, Blade, Turbine, Front, First Stage Inspection	SWP 505 02
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine Parts - Cleaning	WP 201 00
Plate - Retaining, Blade, Turbine, First Stage (Front) Repair	WP 402 00
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00
Nondestructive Evaluation System Reliability Accessment	MIL-HDBK-1823

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 1st stage turbine blade front retaining plate.

2. FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE - INSPECTION.

(See Figures 1, 1A, and 2.)

a. Ensure that first stage turbine blade front retaining plate has been cleaned per WP 201 00.

NOTE

Retaining plate shall be constrained when inspecting to dimensional limits in WP 801 00.

b. See figure 1 for specific inspection areas and limits.

c. Fluorescent penetrant inspect first stage turbine blade front retaining plate for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed.

d. Eddy current inspect first stage turbine blade front retaining plate per paragraph 3. Refer to T.O. 2J-F100-9.

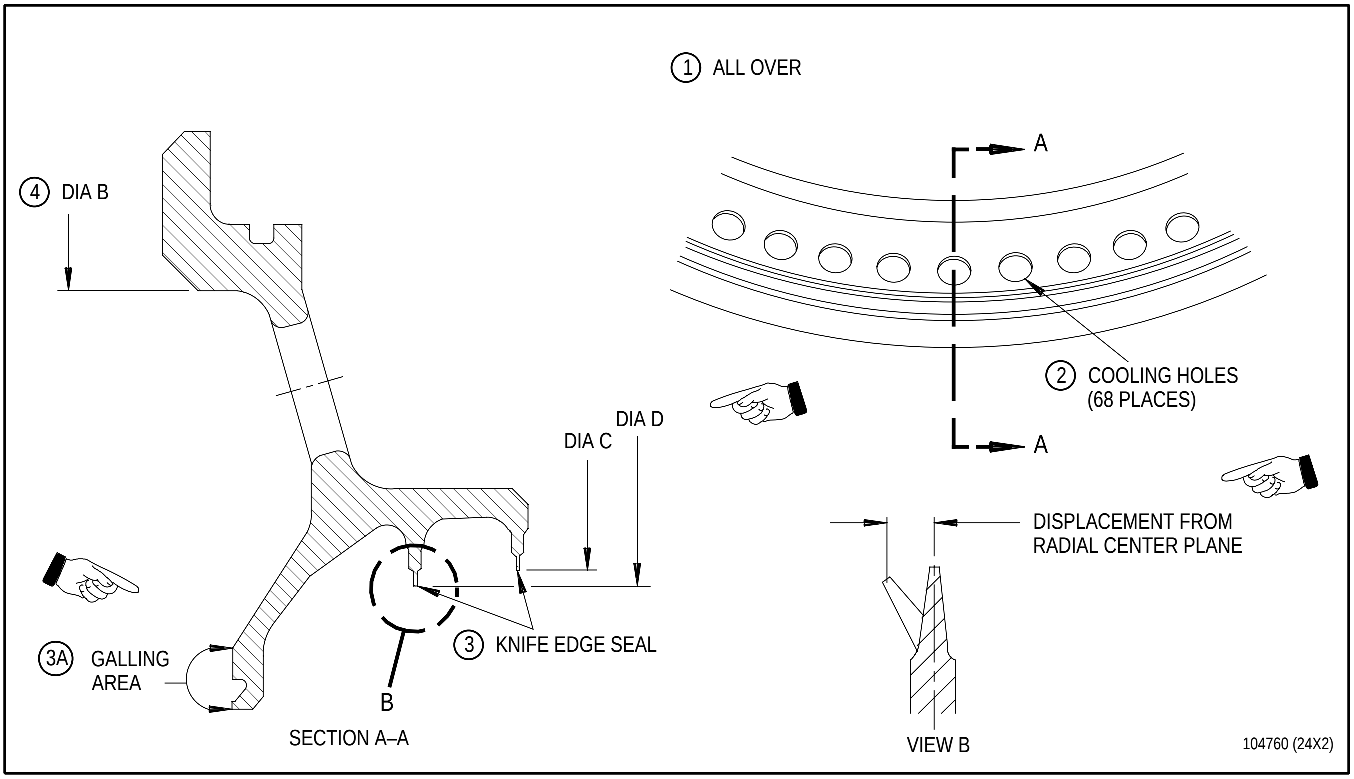


Figure 1. First Stage Turbine Blade Front Retaining Plate - Inspection

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. All over (except knife-edge seals and cooling holes) -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Dents, nicks, scratches	Not serviceable	0.005 inch	Blend repair per WP 402 00.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Cooling holes -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
3. Knife-edge seals -			
Wear	Average minimum serviceable diameters: Diameter C 17.402 inches Diameter D 17.504 inches	Average minimum reparable diameters: Diameter C: 17.394 inches Diameter D: 17.496 inches	Strip and recoat per WP 402 00
Bent	0.500 inch in length per knife-edge. 0.050 inch maximum displacement from radial center plane	Damage is reparable if the final blend meets the blend limits in WP 402 00	Blend repair per WP 402 00.
Nicks and dents	Not serviceable	Damage is reparable if the final blend meets the blend limits in WP 402 00	Blend repair per WP 402 00.
Cracks	Not serviceable	Not reparable	Replace retaining plate
Chipped or missing coating	Visible as lost top coating missing from bond coat layer be defined lines of demarcation. See figure 1A. Coating may be chipped or missing in up to six 0.250 inch long areas, but shall be separated by at least one inch per knife-edge.	Any amount	Strip and recoat per WP 402 00.
3A. Galling area -	Not serviceable	0.005 inch deep	Blend repair per WP 402 00.
4. Diameter B -			
Wear	15.571 to 15.574 inch diameter	See corrective action	Repair per WP 402 00.

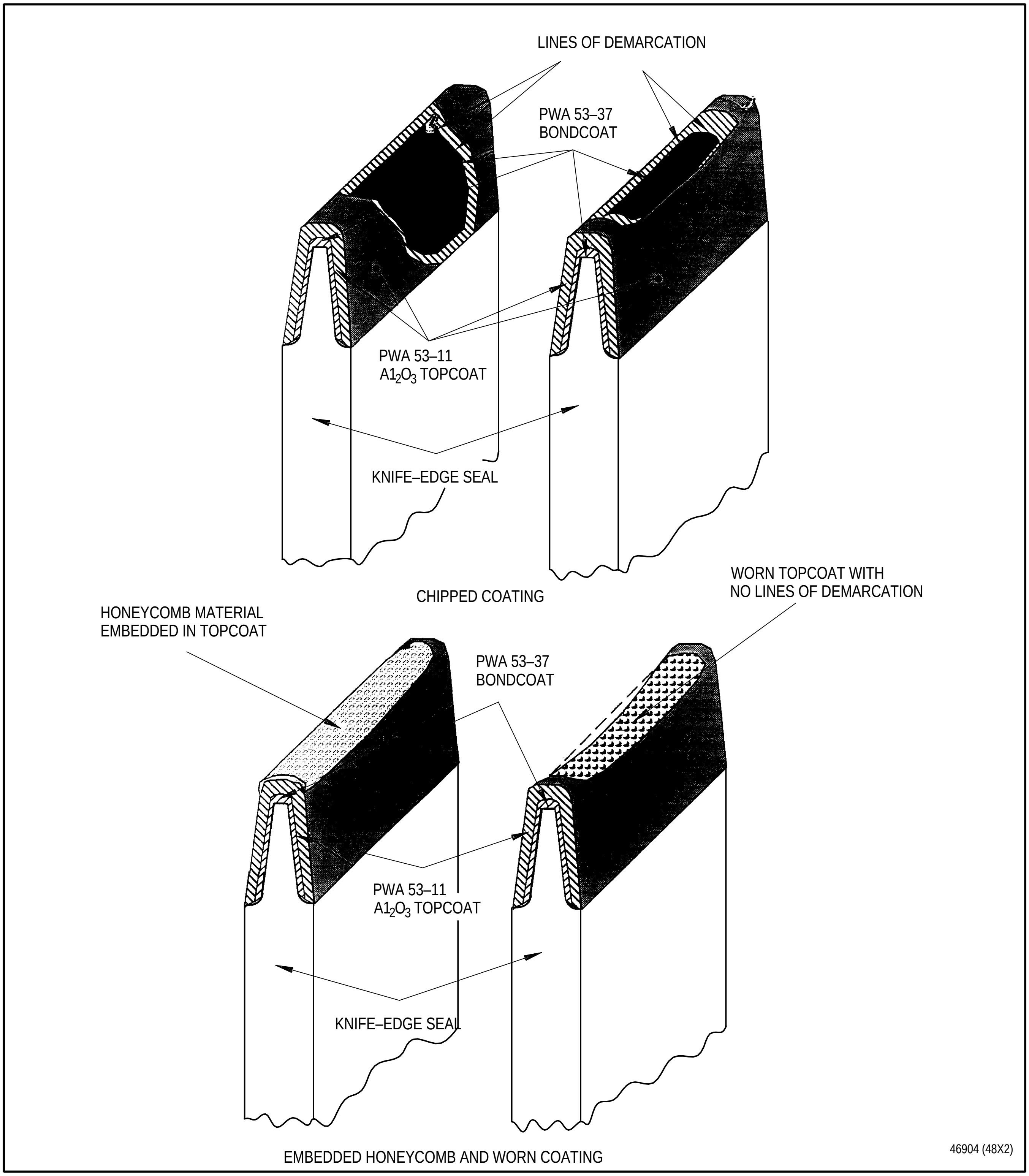


Figure 1A. First Stage Blade Retaining Plate - Chipped Coating, Embedded Honeycomb, and Worn Coating

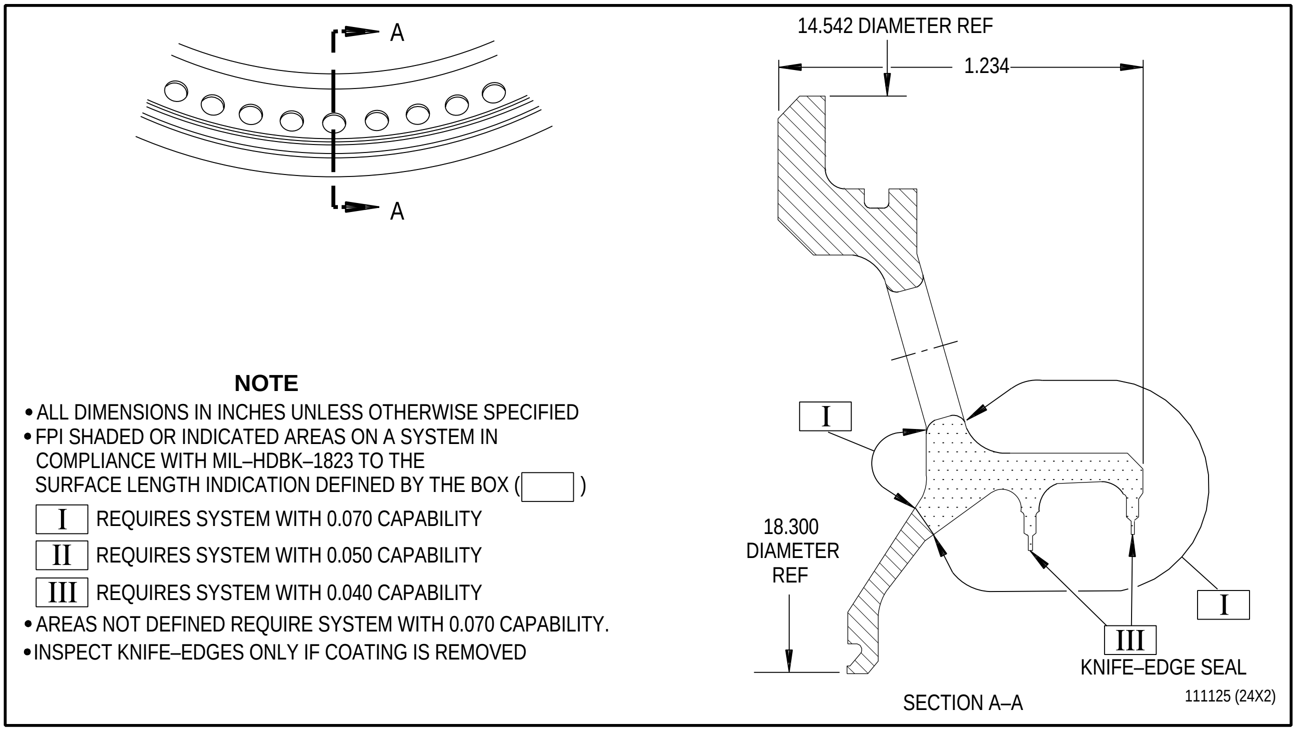


Figure 2. First Stage Turbine Blade Front Retaining Plate - Required Fluorescent Penetrant System Capability

3. EDDY CURRENT INSPECTION USING PN 112366 FULLY AUTOMATED INSPECTION STATION VERSION 3 FOR FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE. (See Figure 3.)

NOTE

- Knife-edges require ECI inspection only if coating is removed.
- FPI knife-edges until ECI capability is available.
- Aft outer radius ECI inspection is optional, operator selectable.

a. Ensure retaining plate has been cleaned per WP 201 00.

b. Prepare ECIS and inspect part. Refer to T.O. 2J-F100-9, SWP 004 09 and SWP 505 02.

c. Evaluate inspection results per figure 3.

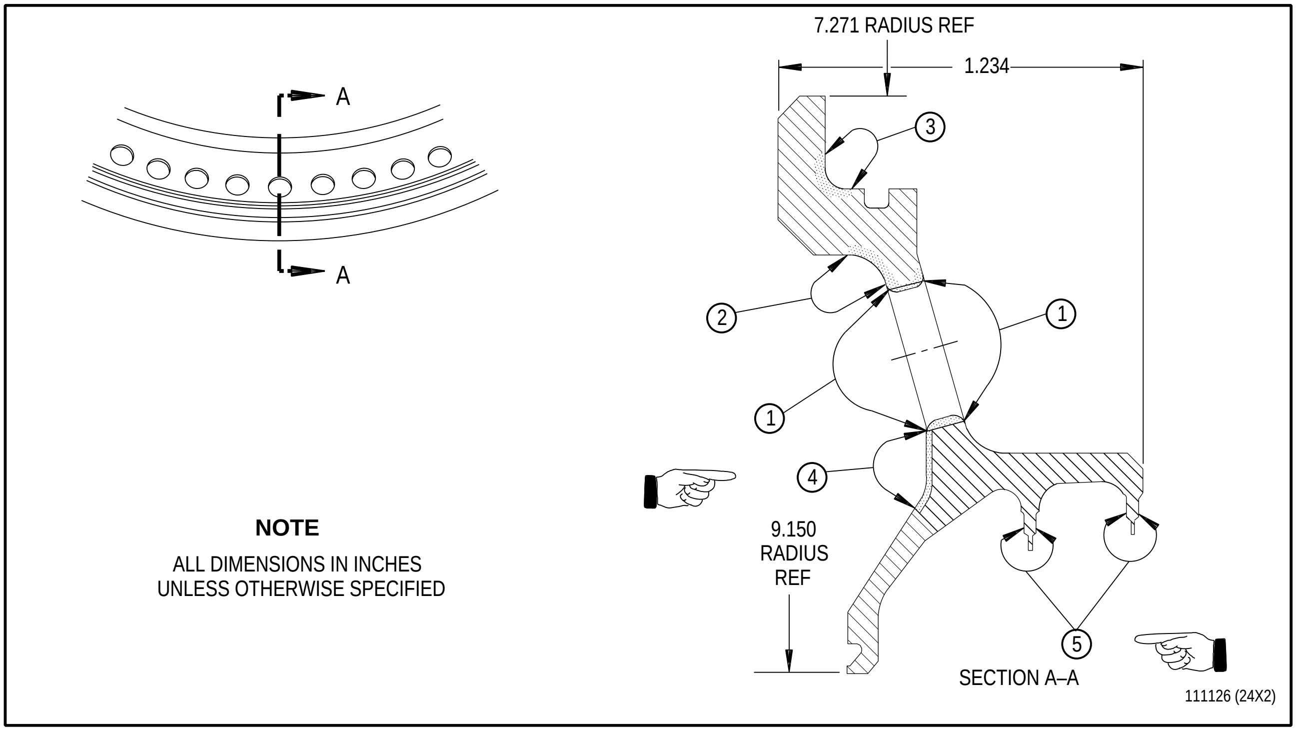


Figure 3. First Stage Turbine Blade Front Retaining Plate - Eddy Current Inspection

Legend for figure 3

Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	ECIS System Rejection Limits Threshold (Counts)	a50 (Inch)	Corrective Action
1. Cooling holes, 68 places -	0.007	Axial	140	0.0056	Replace retaining plate.
2. Aft inner radius -	0.015	Circumferential	2901	0.0129	Replace retaining plate.
3. Forward inner radius -	0.010	Circumferential	1079	0.0086	Replace retaining plate.
4. Aft outer radius -	0.035	Axial, Radial Circumferential	3448	0.0138	Replace retaining plate.
5. Knife-edges -	0.020	Axial, Radial	TBD	TBD	Replace retaining plate.

*Eddy current inspect on system in compliance with MIL-HDBK-1823.

WORK PACKAGE

TECHNICAL PROCEDURES

BLADE - TURBINE ROTOR, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	20	4	0	10 - 12	0
2	6	5 - 9	17	13	6
3	20			14 Blank	6

REFERENCE MATERIAL REQUIRED

Title		Number
Standard Maintenance Procedures	- - - - - - - - - - - - - - - - -	T.O. 2-1-111
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 1st stage turbine rotor blades.

2. FIRST STAGE TURBINE ROTOR BLADES - INSPECTION.

(See Figures 1 through 3.)

a. Ensure that first stage turbine rotor blades have been cleaned per WP 201 00.

b. Visually inspect blades for fracture. If any first stage turbine blades are found liberated or partially missing, perform inspections. Refer to T.O. 2J-F100-53-2, WP 037 00, Table 1.

c. Visually inspect blades for cracks at blade root, leading edge, and fillet radius between blade and platform. Inspect for rub, burning, corrosion, nicks and dents caused by foreign object damage. Refer to figures 1 and 2 for specific inspection areas and limits.

d. Fluorescent penetrant inspect first stage turbine rotor blades for cracks on a system currently qualified per MIL-STD-1823 at 90 percent probability of detection and 50 percent confidence level to surface length indication of 0.070 inch long. Refer to T.O. 2J-F100-9. No cracks allowed. See figure 3.

e. Turbine blade appearance or laboratory tests that indicate airfoil overtemperature has occurred, is cause for scrapping of blade. Refer to T.O. 2-1-111.

f. Turbine blades meeting inspection service limits shall be used on minor repair 1st stage turbine disk and blade assemblies.

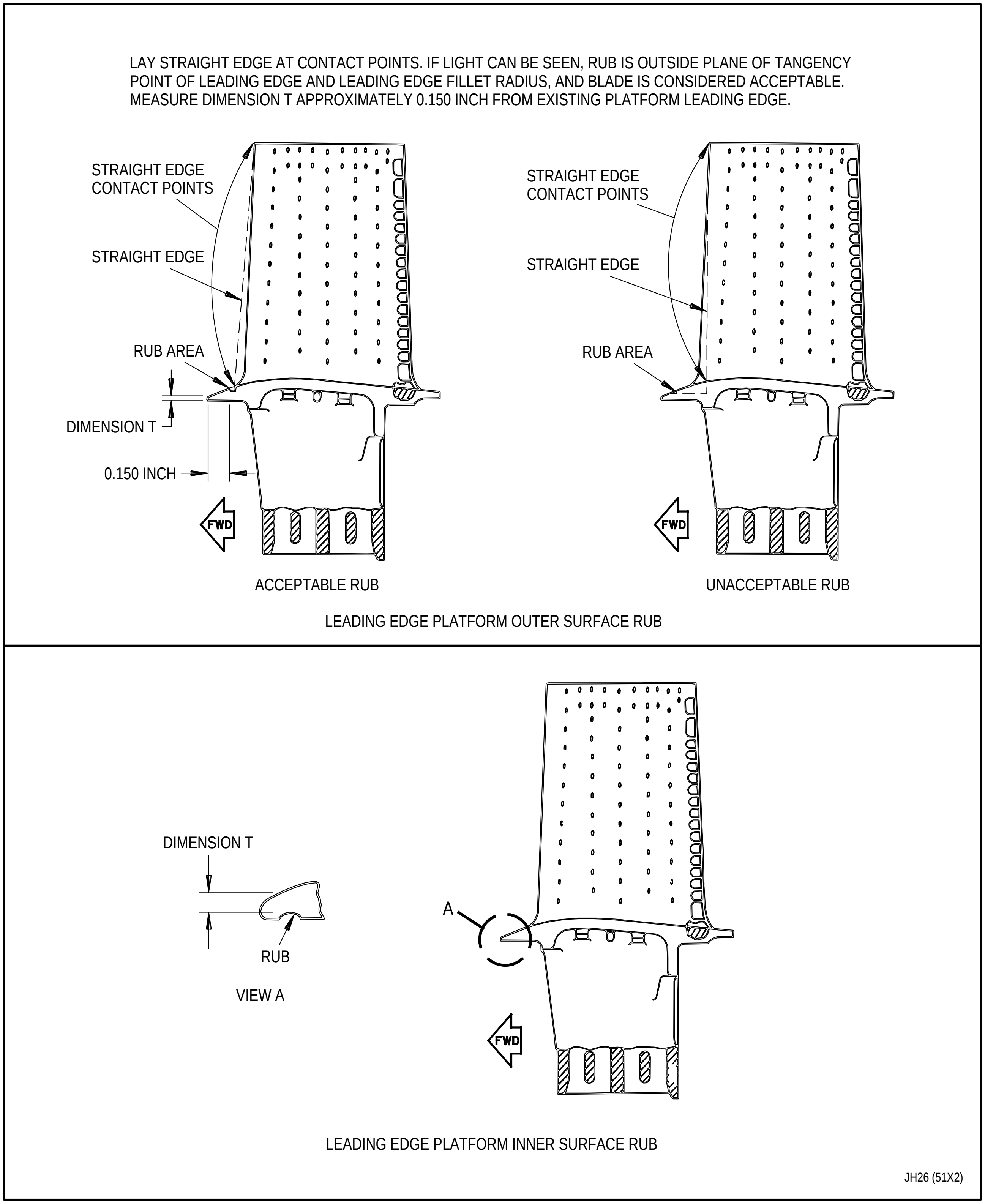
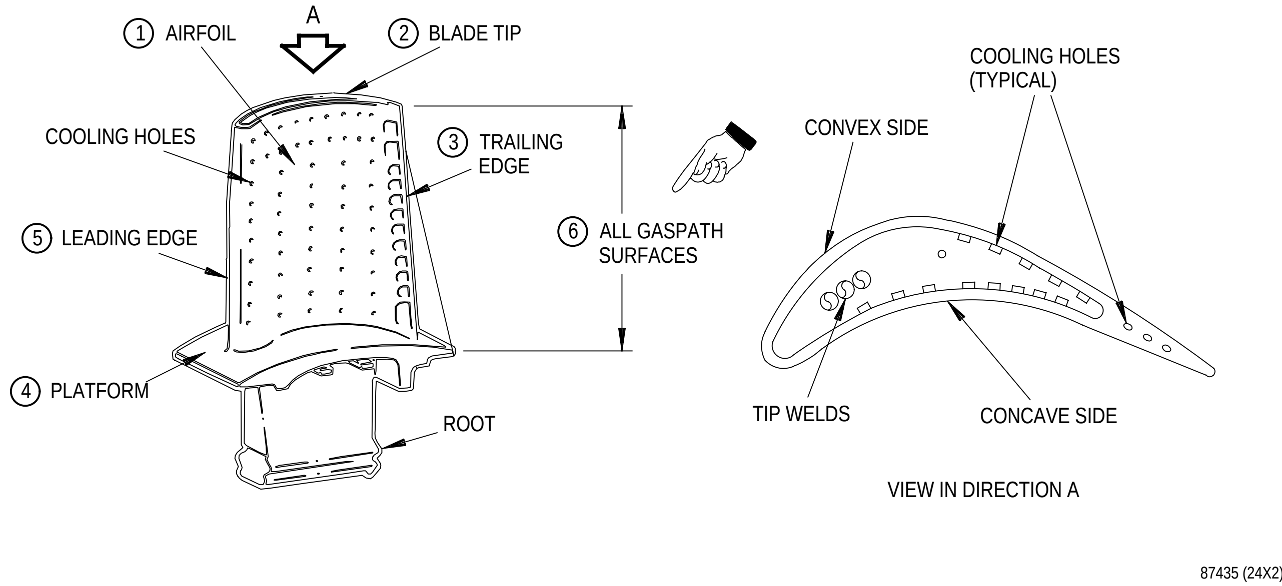


Figure 1. First Stage Turbine Rotor Blade - Leading Edge Platform Rub Inspection



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Airfoil -			
Foreign material splatter	Serviceable up to 0.005 inch	Foreign material shall be completely removed	Clean per WP 201 00.
Erosion	Surface erosion into parent material is not serviceable	See corrective action	Replace blade.
Nicks and dents	Two allowed per side with 0.030 inch maximum surface dimension. Shall be clearly separated.	See corrective action	Replace blade.
Cracks	Not serviceable	See corrective action	Replace blade.

Figure 2. . First Stage Turbine Blade Inspection

Legend for figure 2 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Blade tip -			
Worn or lost coating	Serviceable	Not required	Not required
Cracks	Not serviceable	See corrective action	Replace blade.
Cracks in tip weld	Allowable in welded areas provided cracks do not extend into parent material. Any amount of cracks per weld permissible provided no weld material is broken out.	See corrective action	Replace blade.
Erosion	Not serviceable	See corrective action	Replace blade.
Rub	Serviceable if blade tip pocket depth is 0.010 inch minimum and blade length is within original limits.	See corrective action	Replace blade.
Nicks and dents	Two locations up to 0.030 inch maximum surface dimension	See corrective action	Replace blade.
Cooling hole blockage or missing	Not serviceable	See corrective action	Replace blade.

Legend for figure 2 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Trailing edge -			
Impact damage, nicks, and dents	Two locations up to 0.030 inch maximum surface dimension	See corrective action	Replace blade.
Pinching or distortion	Not serviceable	See corrective action	Replace blade.
Cracks	Not serviceable	See corrective action	Replace blade.
Erosion	Surface erosion into parent material is not serviceable	See corrective action	Replace blade.
4. Platform -			
Outer surface: (Airfoil side)			
Rub	Serviceable if rub is outside tangency plane of leading edge and leading edge fillet radius (see figure 1). Any depth is serviceable as long as dimension T is 0.050 inch or greater.	Not reparable	Replace blade.
Erosion	Not serviceable	See corrective action	Replace blade.
Cracks	Not serviceable	See corrective action	Replace blade.
Inner surface: (Root side)			
Rub, grooving, or wear	Grooving or wear is serviceable provided Dimension T is 0.050 inch or greater	Not reparable	Replace blade.

Legend for figure 2 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Leading edge -			
Erosion	Not serviceable	See corrective action	Replace blade.
Cracks	Not serviceable	See corrective action	Replace blade.
Foreign material splatter	Not serviceable	Any plugged cooling holes shall be cleared	Foreign material splatter will be removed by strip and recoat procedure. Blocked cooling holes shall be hand probed. If unable to clear, replace blade.
Impact damage, nicks and dents	Not serviceable	See corrective action	Replace blade.
Cooling hole blockage	Not serviceable	Blocked holes shall be cleared	Hand probe blocked holes; if holes cannot be cleared, replace blade.
6. All gaspath surfaces:			
Coating -			
Chipping, flaking, peeling, or blistering	Not serviceable	Not reparable	Replace blade.

NOTE

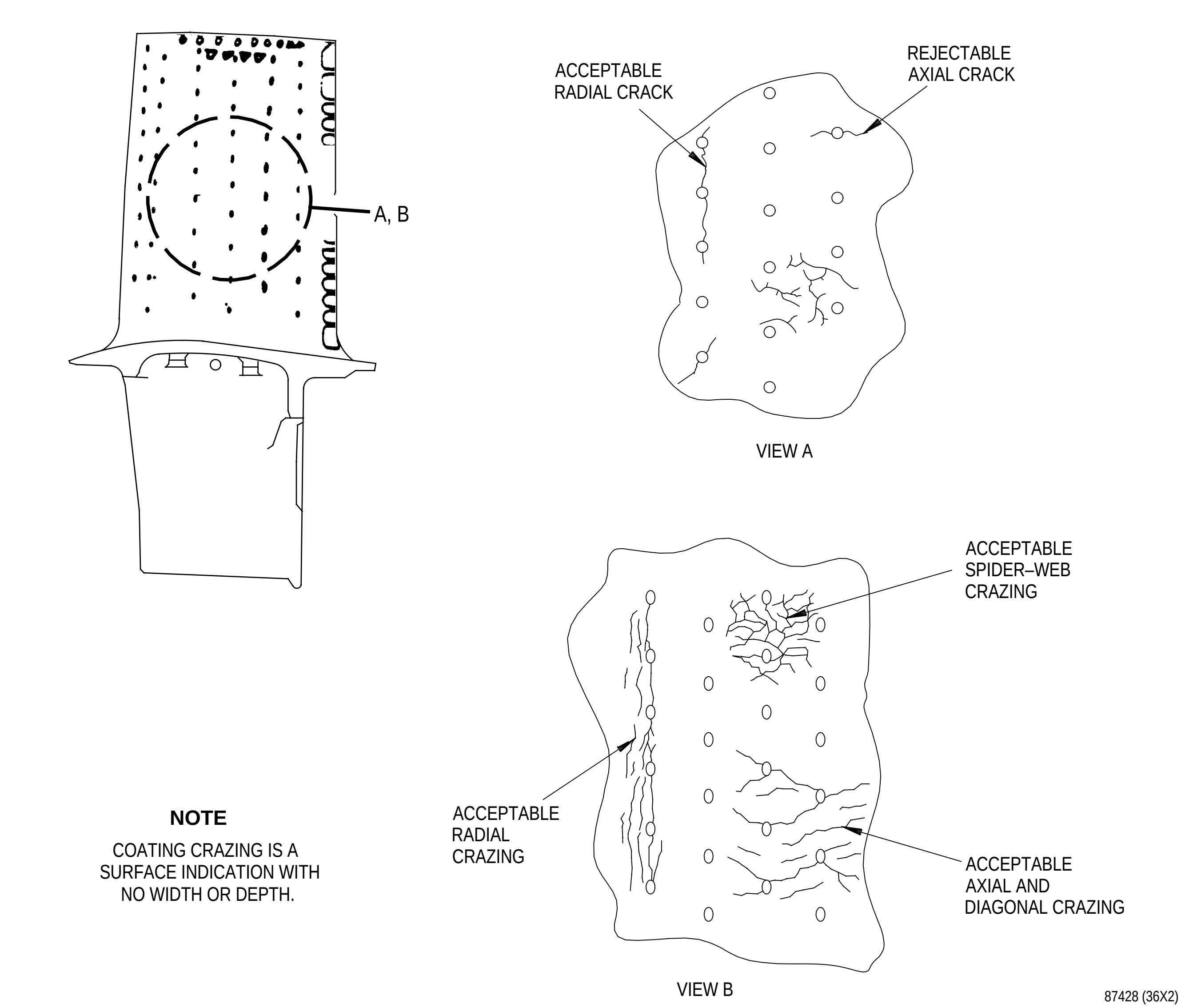
Coating crazing consists of many small, crack-like indications, aligned axially, radially, or in a spider-web pattern. Usually found on concave surface of airfoil and platform, crazing is only present in the coating, with indications having no apparent width or depth. Coating craze should not be confused with fatigue-style cracks, which have both width and depth, extend through the coating into base material, and are usually accompanied by erosion. See Figure 2A.

Crazing	Serviceable	Not required.	Not required.

NOTE

Pits, porosity, and voids are all imperfections which occur during original part manufacture, and should be disregarded during part inspection. They are different from nicks, dents, and impact damage, which occur after part manufacture.

Pits, porosity, voids -	Serviceable	Not required.	Not required.



NOTE

COATING CRAZING IS A SURFACE INDICATION WITH NO WIDTH OR DEPTH.

Figure 2A. First Stage Turbine Rotor Blade Assembly - Crack Inspection

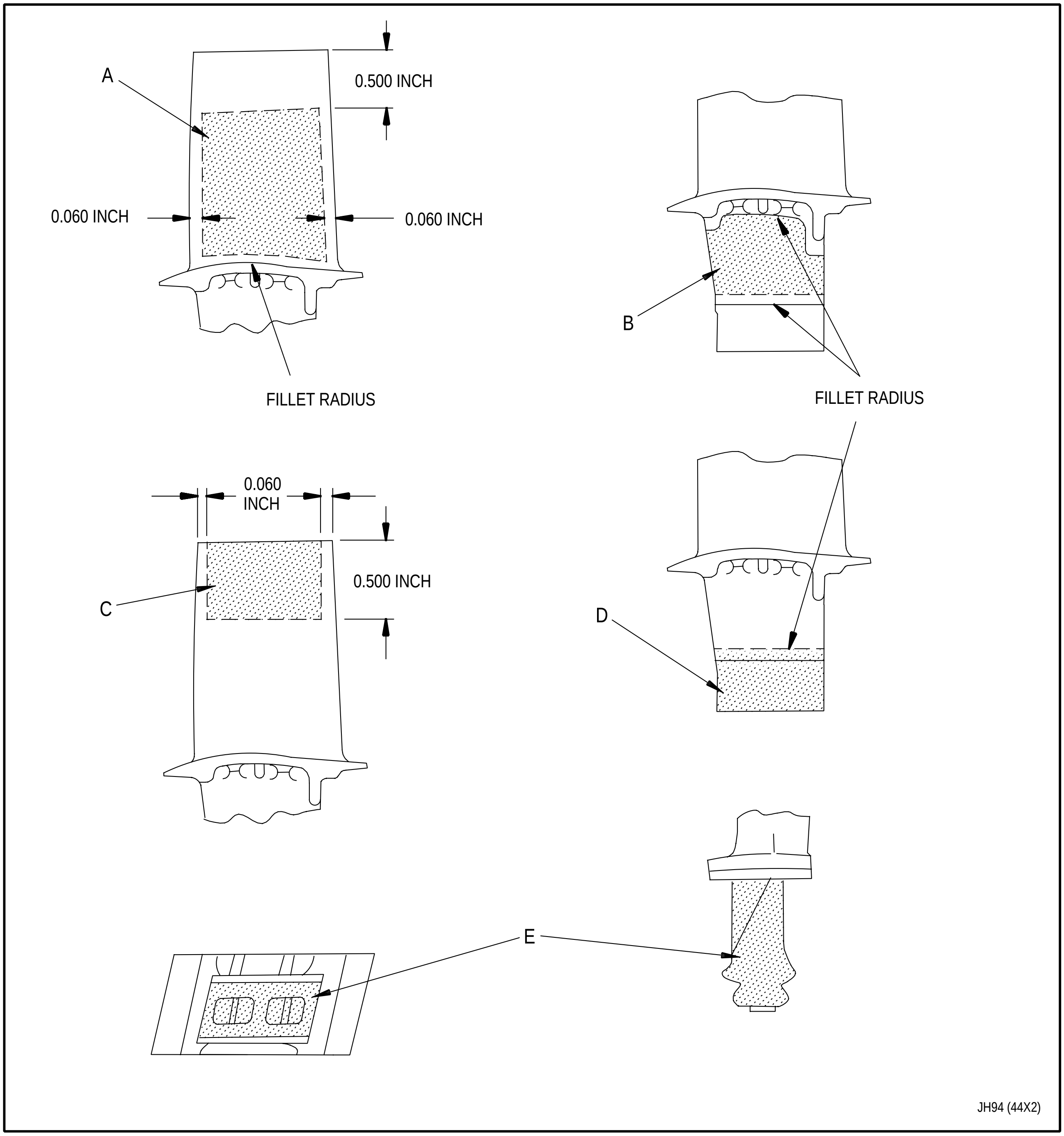
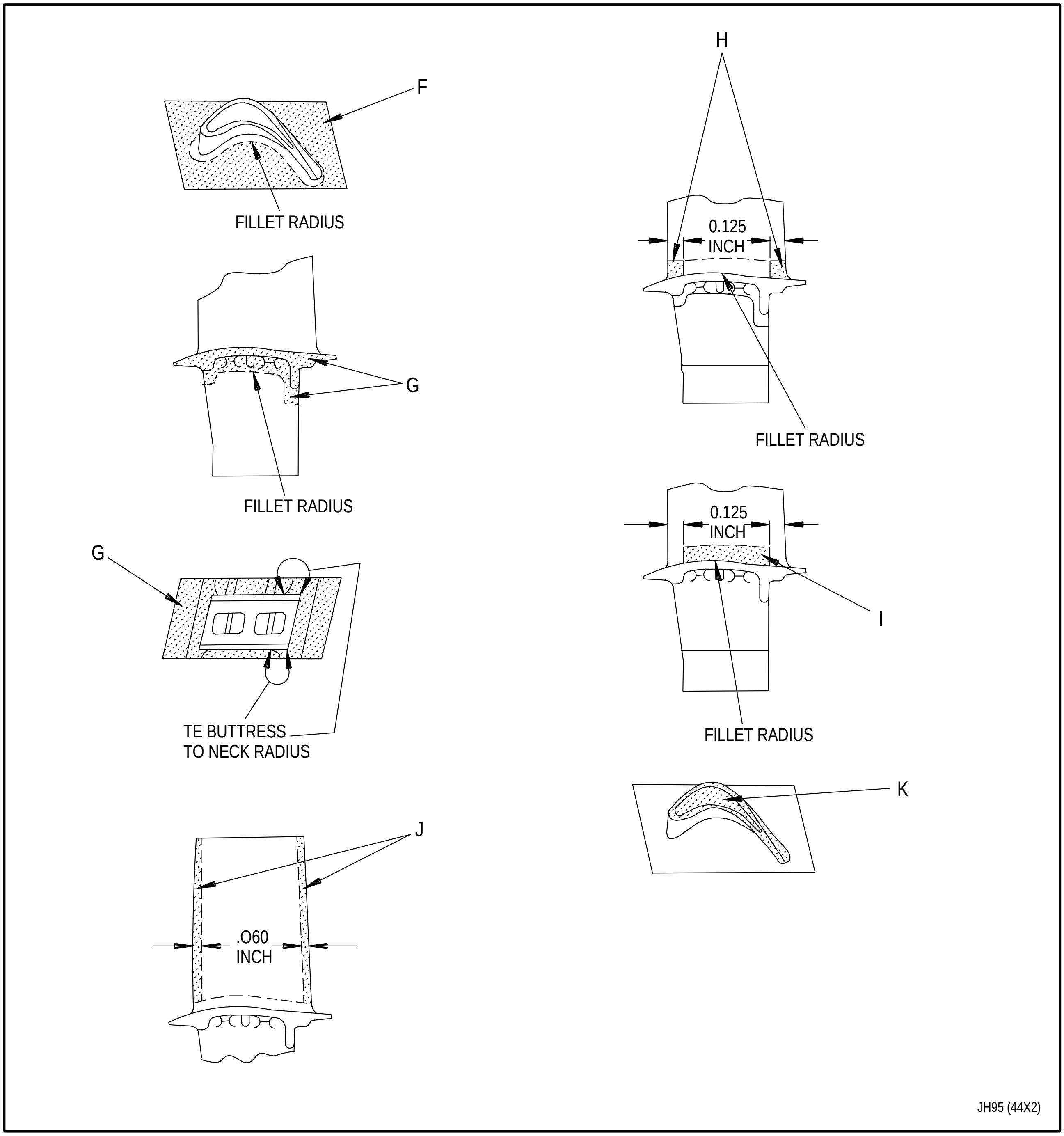


Figure 3. First Stage Turbine Rotor Blade Assembly - Fluorescent Penetrant Inspection Areas (Sheet 1 of 2)



Area	Maximum Quantity of Discontinuities/Imperfections	Minimum Separation (Inch)	Maximum Diameter (Inch)
A	10 per side (limits include dross)	0.125	0.030

Figure 3. First Stage Turbine Rotor Blade Assembly - Fluorescent Penetrant Inspection Areas (Sheet 2 of 2)

Legend for figure 3 (continued)

Area	Maximum Quantity of Discontinuities/Imperfections	Minimum Separation (Inch)	Maximum Diameter (Inch)
B	4 per side	0.125	0.030
	plus 3 per side	Clearly Separated	0.020
	plus 5 raised imperfections (limits include dross which shall be no closer than 0.045 inch to fillet radius)	0.125	0.030
C	20 per side, which may be in linear alignment (limits include dross)	Clearly Separated	0.030
D	Unlimited number	0.050	0.015
E	4 per side	0.250	0.050
	plus 3 total (limits include dross which shall be no closer than 0.045 inch to fillet or edge radii, except dross located inside cooling hole may break edge radii)	Clearly Separated	0.020
F	5 per part	0.125	0.060
	plus 3 per part	Clearly Separated	0.020
	plus any amount in an area 0.250 inch by 0.500 inch not in linear alignment. (Limits include dross which shall be no closer than 0.045 inch to fillet radius)	Clearly Separated	0.015
G	Any amount which may be in linear alignment provided not in TE buttress to neck radius (limits include dross which shall be no closer than 0.045 inch fillet radius)	Clearly Separated	0.020

Legend for figure 3 (continued)

Area	Maximum Quantity of Discontinuities/Imperfections	Minimum Separation (Inch)	Maximum Diameter (Inch)
H	4 total	Clearly Separated	0.015
I	4 per side	0.250	0.030
	plus 4 total	Clearly Separated	0.015
J	4 per edge	0.125	0.020
K	Any amount of voids in tip plug weld	Clearly Separated	0.030
	2 cracks confined in weld only (void and crack limits are acceptable provided airflow check is acceptable)	Clearly Separated	Not applicable

All data on page 14, including paragraph 3, deleted

WORK PACKAGE

TECHNICAL PROCEDURES

DISK - TURBINE, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine Parts - Cleaning	WP 201 00
Disk - Turbine, First Stage - Repair	WP 404 00
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 1st stage turbine disk.

2. FIRST STAGE TURBINE DISK - INSPECTION. (See Figures 1 through 3.)

CAUTION

Inspection of turbine disk is a critical task. Do not rework any disk that has a crack or any indication not clearly the result of localized damage (nicks, dents or scratches). Presence of cracks or other unusual conditions confirmed by nondestructive inspection or visual examination are cause for rejection.

a. Clean first stage turbine disk immediately prior to inspection per WP 201 00, to ensure disk is absolutely clean.

b. Visually inspect disk per figure 1.

(1) Depth of damage, especially on curved areas or areas which are difficult to see, may be compared with samples having known damage depths.

(2) Pay attention to the following areas:

- Tierod holes
- Counterweight holes
- Blade slots
- Bore

c. Fluorescent penetrant inspect first stage turbine disk for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-f100-9. No cracks allowed. All crack indications observed are cause for rejection and require Material Review Board (MRB) evaluation. See figure 2.

d. Eddy current inspection disk per requirements of fighre 3. Refer to T.O. 2J-F100-9.

e. See figure 1 for acceptability and reparability of specific areas. Although some conditions are acceptable without repair, it may be desirable to blend repair areas with sharp surface damage.

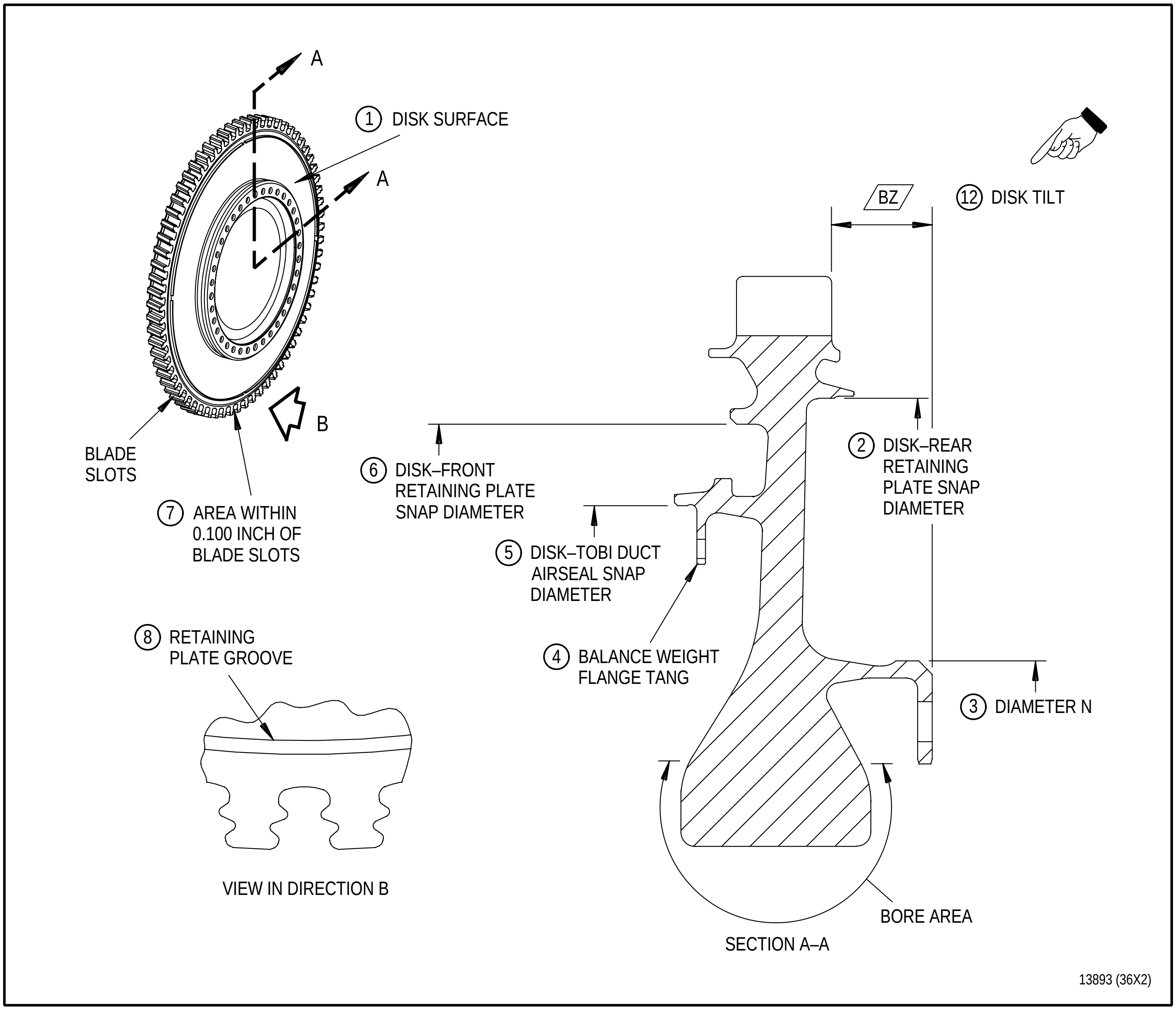


Figure 1. First Stage Turbine Disk - Inspection (Sheet 1 of 3)

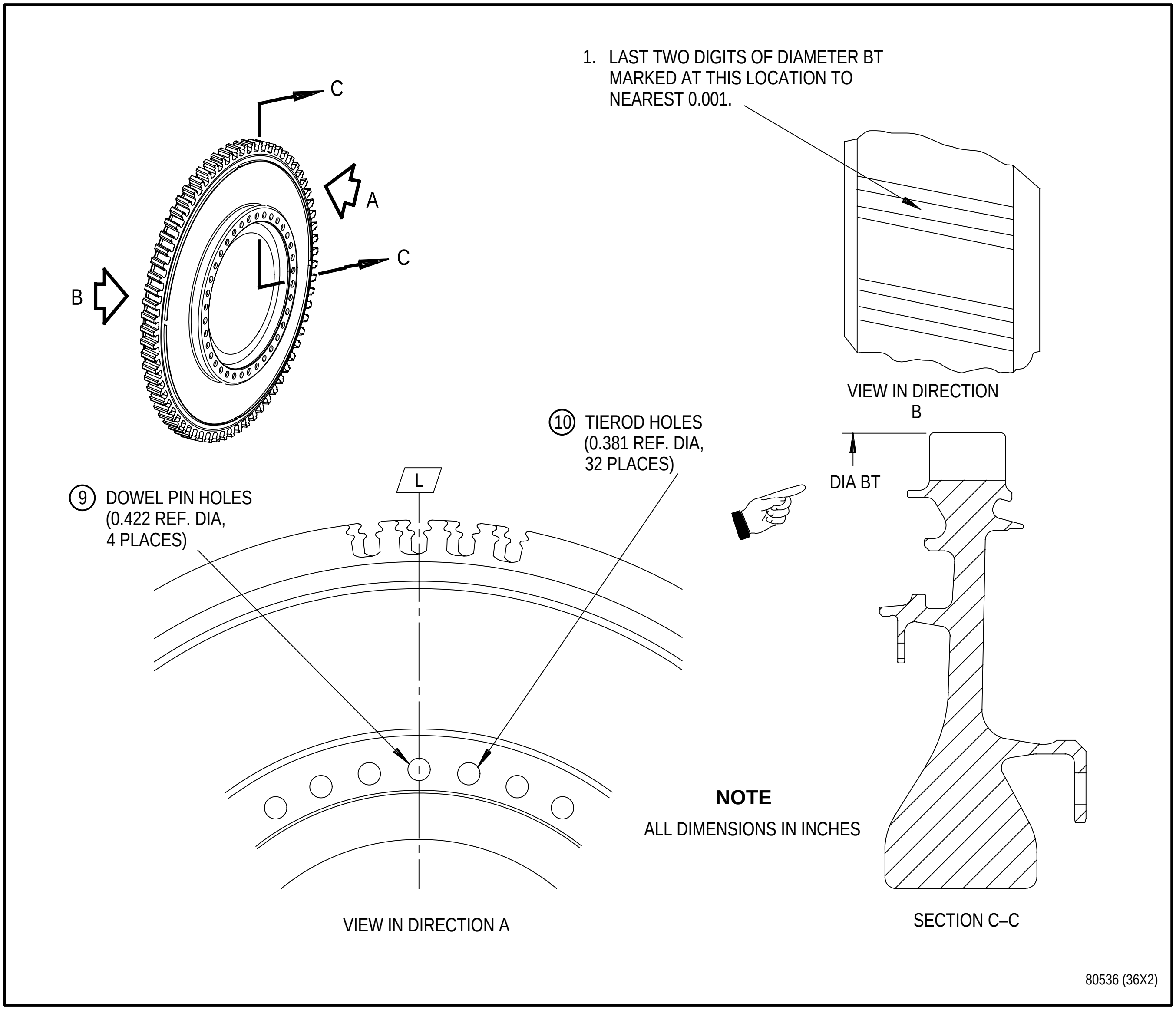
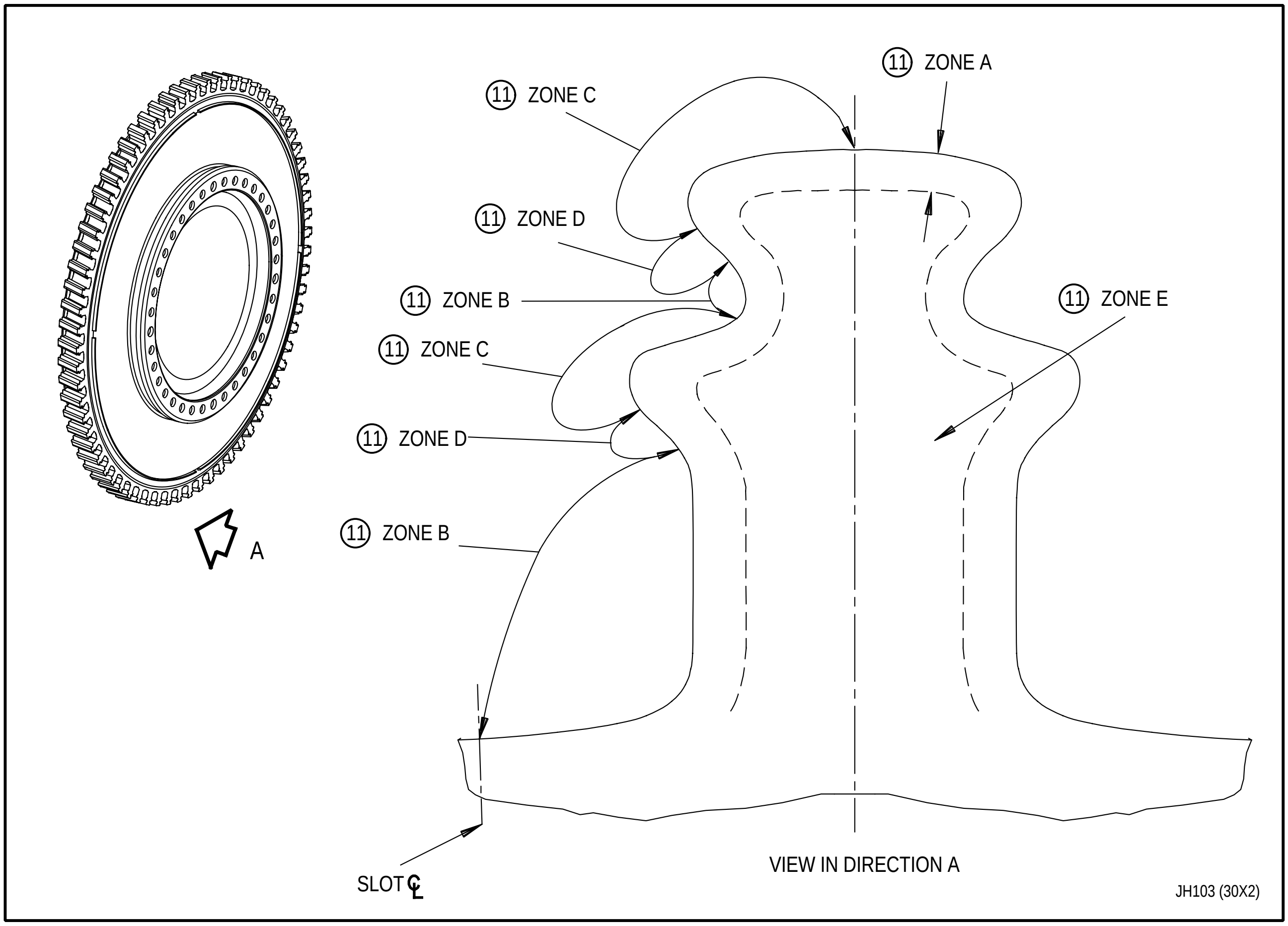


Figure 1. First Stage Turbine Disk - Inspection (Sheet 2 of 3)



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Disk surface (not within 0.100 inch of blade slots) -			
Cracks	Not serviceable	Not reparable	Replace disk.
Nicks, Dents	Not serviceable	See corrective action	Replace disk.
Scratches	Not serviceable	See corrective action	Replace disk.

Figure 1. First Stage Turbine Disk - Inspection (Sheet 3 of 3)

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Disk - rear retaining plate snap diameter -			
Wear	16.017 to 16.021 inch diameter	See corrective action	Replace disk.
3. Diameter N -			
Wear	10.987 to 10.991 inch diameter	See corrective action	Replace disk.
4. Balance weight flange tang -			
Cracked, broken or sheared	Not serviceable	See corrective action	Repair tang per WP 404 00.
Bent	0.020 inch out of plane (as measured from tip)	See corrective action	Repair tang per WP 404 00.
5. Disk tobi duct air seal snap diameter -			
Wear	13.970 inch maximum diameter	See corrective action	Replace disk.
6. Disk-front retaining plate snap diameter -			
Wear	15.542 inch maximum diameter	See corrective action	Replace disk.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
7. Area within 0.100 inch of blade slots -			
Cracks	Not serviceable	Not reparable	Replace disk.
Nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
8. Retaining plate groove -			
Suspected cracks via FPI	Not serviceable	Not reparable	Replace disk.
Nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
9. Dowel pin holes 0.422 inch Ref. diameter -			
Suspected cracks via FPI	Not serviceable	See corrective action	Blend repair per WP 404 00.
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Blend repair per WP 404 00.
10. Tierod holes 0.381 inch Ref. diameter -			
Suspected cracks via FPI	Not serviceable	See corrective action	Replace disk.
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
11. Blade slot -			
Zone A - (Typical both sides)			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone B -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone C -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone D -			
Pits, nicks, dents, scratches	Not serviceable	Not reparable	Replace disk.
Zone E -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
12 Disk tilt -			
Dimension BZ (From flange to disk lug)	Not to exceed 0.980 inches	Not reparable	Replace disk

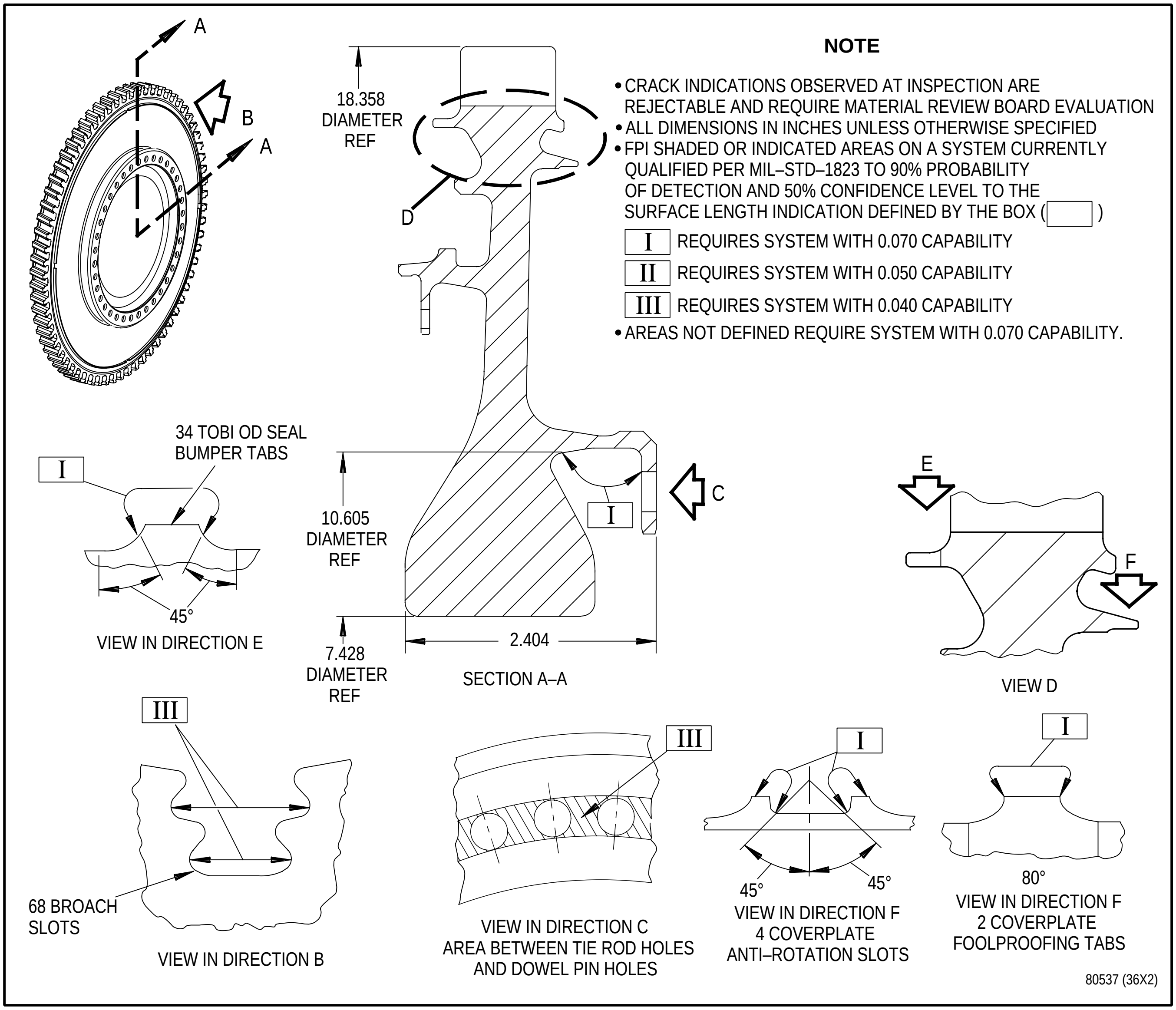


Figure 2. First Stage Turbine Disk - Required Fluorescent Penetrant System Capability

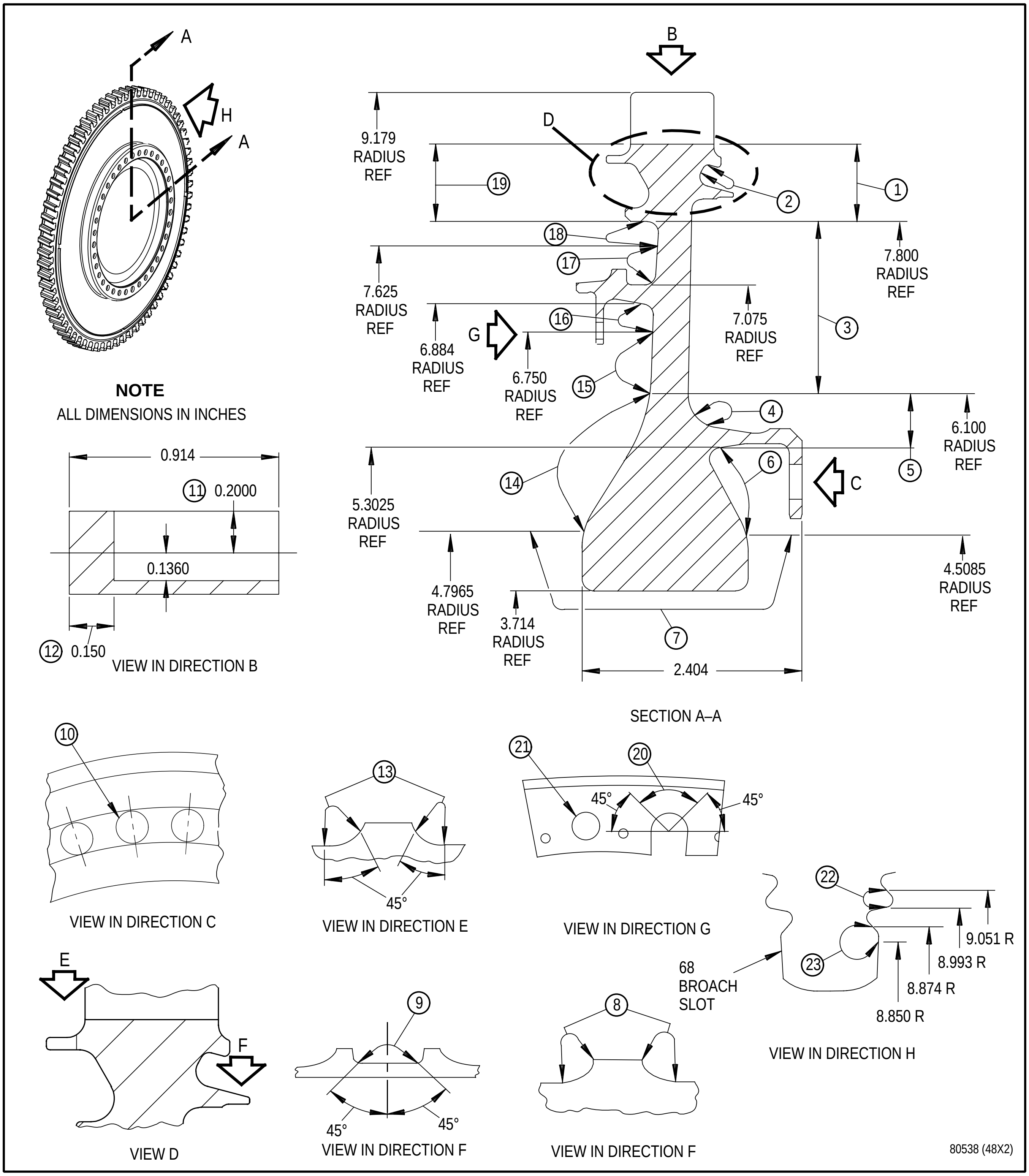


Figure 3. First Stage Turbine Disk - Eddy Current Inspection

Legend for figure 3

	Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	SRL System Rejection Limits		Corrective Action
				(Counts)	(A50-inch)	
1.	Area from flange to disk lug	0.010	Circumferential, Radial	TBD	TBD	Replace 1st stage disk.
2.	Disk rear rim area	0.008	Circumferential	TBD	TBD	Replace 1st stage disk.
3.	Disk rear web	0.010	Circumferential, Radial	TBD	TBD	Replace 1st stage disk.
4.	Disk rear web radius	0.008	Circumferential, Axial	TBD	TBD	Replace 1st stage disk.
5.	Disk rear flange	0.010	Circumferential, Axial	TBD	TBD	Replace 1st stage disk.
6.	Flange web area	0.010	Radial	TBD	TBD	Replace 1st stage disk.
7.	Bore area	0.008	Radial, Axial	TBD	TBD	Replace 1st stage disk.
8.	Coverplate foolproofing tabs, 2 places	0.005	Radial	TBD	TBD	Replace 1st stage disk.
9.	Coverplate anti-rotation slots, 4 places	0.005	Radial	TBD	TBD	Replace 1st stage disk.
10.	Tierod holes, 32 places and dowel pin holes, 4 places	0.005	Axial	TBD	TBD	Replace 1st stage disk.
11.	Blade slot area, 68 places	0.005	Axial	TBD	TBD	Replace 1st stage disk.
12.	Forward blade slot area, 68 places	0.015	Axial	TBD	TBD	Replace 1st stage disk.
13.	TOBI OD seal bumper tabs, 34 places	0.005	Radial	TBD	TBD	Replace 1st stage disk.
14.	Disk front web	0.010	Radial	TBD	TBD	Replace 1st stage disk.

*Eddy current inspect on system currently qualified per MIL-STD-1823 at 90% probability of detection and 50% confidence level for required flaw depth.

Legend for figure 3 (Continued)

Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	SRL System Rejection Limits (Counts)	SRL System Rejection Limits (A50-inch)	Corrective Action
15. Disk front web area	0.010	Circumferential, Radial	TBD	TBD	Replace 1st stage disk.
16. Front flange radius	0.005	Circumferential, Radial, Axial	TBD	TBD	Replace 1st stage disk.
17. Disk outer front area	0.010	Circumferential, Radial	TBD	TBD	Replace 1st stage disk.
18. Disk rim inner radius	0.005	Circumferential, Radial, Axial	TBD	TBD	Replace 1st stage disk.
19. Disk front rim area	0.015	Radial	TBD	TBD	Replace 1st stage disk.
20. Balance flange scallops, 32 places	0.005	Axial	TBD	TBD	Replace 1st stage disk.
21. TOBI ID bolt holes, 8 places	0.005	Axial	TBD	TBD	Replace 1st stage disk.
22. Disk broach outer tooth	0.020	Axial	TBD	TBD	Replace 1st stage disk.
23. Disk broach inner tooth	0.020	Axial	TBD	TBD	Replace 1st stage disk.

*Eddy current inspect on system currently qualified per MIL-STD-1823 at 90% probability of detection and 50% confidence level for required flaw depth.

3. FIRST STAGE TURBINE DISK - STRETCH MEASUREMENT. (See figure 1, sheet 2.)

a. Perform stretch measurement as follows:

(1) Obtain average diameter by starting at Location L and measuring dimension across Diameter BT, at four equally spaced places.

(2) If average diameter exceeds dimension marked on disk by more then 0.015 inches, hold for future disposition.

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE ASSEMBLY - RETAINING, BLADE, TURBINE, REAR, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	23	3	0	4 - 6	23
2	22			7 - 8 Added	22

REFERENCE MATERIAL REQUIRED

Title		Number
Standard Maintenance Procedures	- - - - - - - - - - - - - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 1st stage turbine blade rear retaining plate assembly.

2. FIRST STAGE TURBINE BLADE REAR RETAINING PLATE ASSEMBLY - INSPECTION. (See Figures 1 and 2.)

a. Ensure that first stage turbine blade rear retaining plate assembly has been cleaned per WP 201 00.

b. Visually inspect retaining plate assembly per figure 1 for specific inspection areas and limits.

c. Fluorescent penetrant inspect retaining plate assembly for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed. All crack indications observed are cause for rejection and require Material Review Board (MRB) evaluation, see figure 2. Refer to T.O. 2-1-111, SPOP 82.

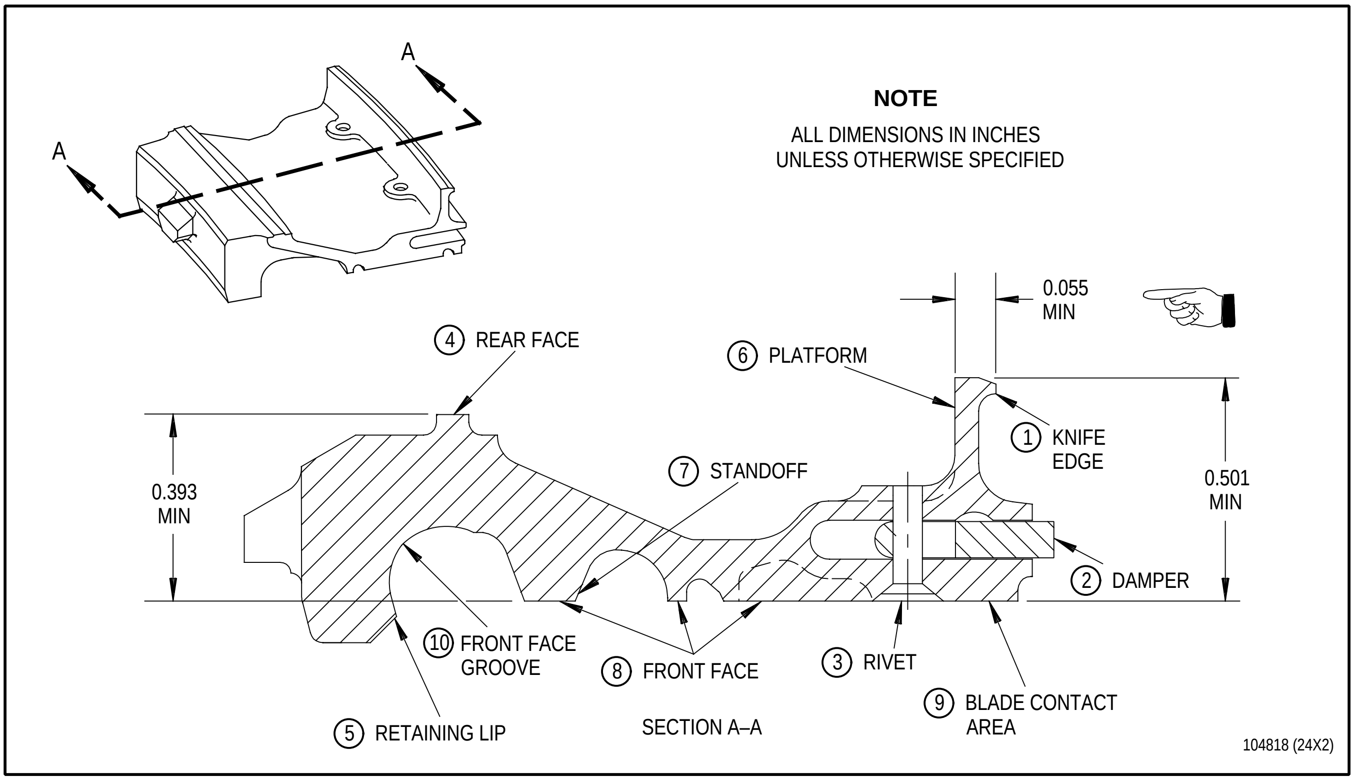


Figure 1. First Stage Turbine Blade Rear Retaining Plate Assembly (Typical PN 4079621) - Inspection (Sheet 1 of 2)

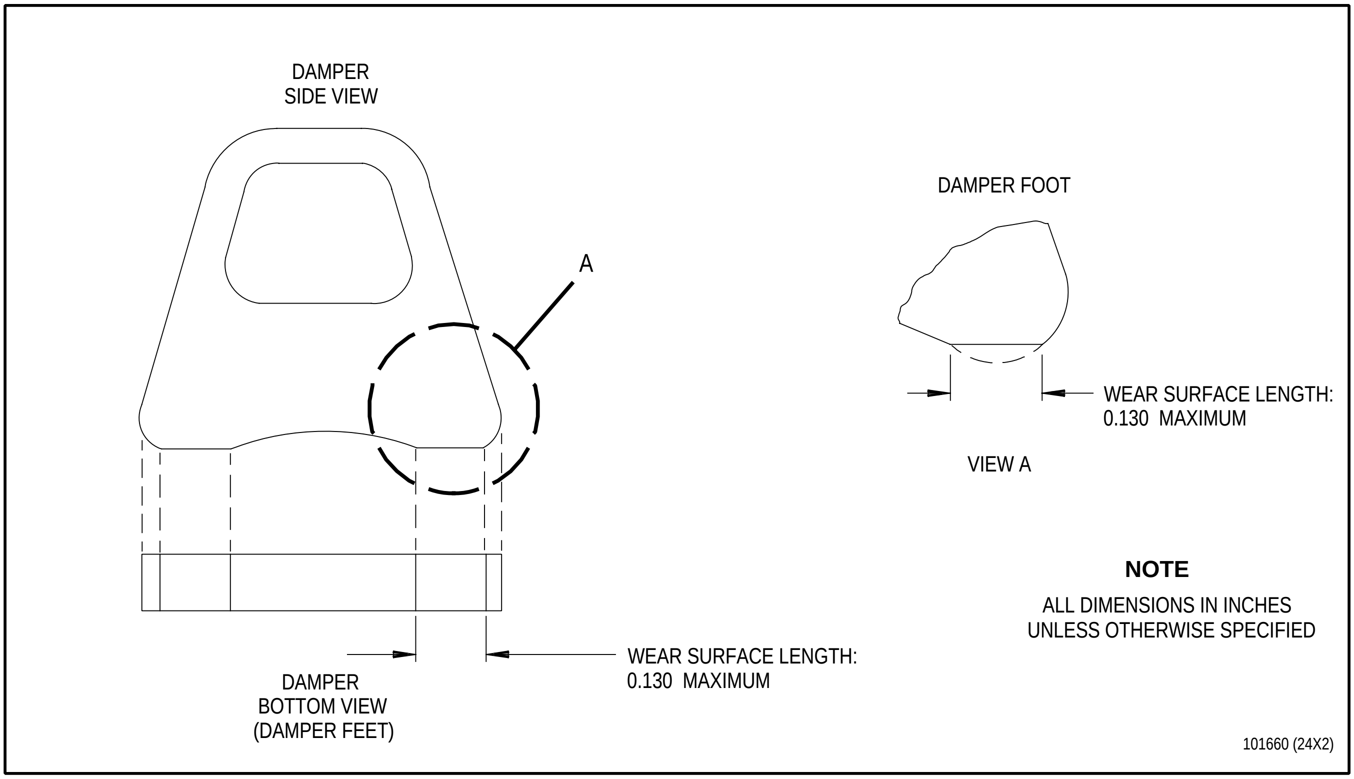


Figure 1. First Stage Turbine Blade Rear Retaining Plate Assembly (Typical PN 4079621) - Inspection (Sheet 2 of 2)

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Knife-edge -			
Rub	0.075 inch minimum thickness	Not reparable	Replace retaining plate.
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Rough or sharp edges	Not serviceable	See corrective action	Blend sharp edges per WP 405 00.
2. Damper -			
Missing, cracked, bent, rough edges	Not serviceable	Not reparable	Replace damper per WP 405 00.
Wear	0.130 inch length	Not reparable	Replace damper per WP 405 00.
Freedom of movement	Shall move freely	See corrective action	Inspect for bent retaining plate tangs. If tangs are not bent, replace rivet, bushing, and damper per WP 405 00.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
3. Rivet -			
Cracked, missing	Not serviceable	See corrective action	Replace rivet per WP 405 00.
4. Rear face -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Nonlinear indications	a. Four indications in 1 inch square, none larger than 0.032 inch	Not reparable	Replace retaining plate.
	b. One cluster maximum in 2 inch square, with cluster 0.125 inch long maximum, and not containing more than one indication of 0.015 inch diameter		
	c. No linear indications allowed.		
Wear	0.393 inch minimum	Not reparable	Replace retaining plate.
5. Retaining lip -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
6. Platform -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Bent	Not serviceable	Not reparable	Replace retaining plate.
7. Standoff -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
8. Front face -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Nonlinear indications	a. Four indications in 1 inch square, none larger than 0.032 inch	Not reparable	Replace retaining plate.
	b. One cluster maximum in 2 inch square, with cluster 0.125 inch long maximum, and not containing more than one indication of 0.015 inch diameter		
	c. No linear indications allowed.		
Wear	0.001 inch minimum	Not reparable	Replace retaining plate.
9. Blade contact area -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Wear	0.501 inch minimum	Not reparable	Replace retaining plate.
10. Front face groove -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
Nonlinear indications	a. 0.015 maximum indication	Not reparable	Replace retaining plate.
	b. Two indications maximum per linear inch of groove area (seven total)		
	c. No clusters allowed		

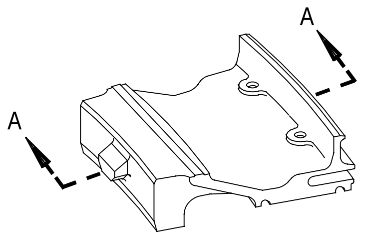
NOTE

- CRACK INDICATIONS OBSERVED AT INSPECTION ARE REJECTABLE AND REQUIRE MATERIAL REVIEW BOARD EVALUATION
- ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
- FPI SHADED OR INDICATED AREAS ON A SYSTEM CURRENTLY QUALIFIED PER MIL–STD–1823 TO 90% PROBABILITY OF DETECTION AND 50% CONFIDENCE LEVEL TO THE SURFACE LENGTH INDICATION DEFINED BY THE BOX ( )

  I REQUIRES SYSTEM WITH 0.070 CAPABILITY

  II REQUIRES SYSTEM WITH 0.050 CAPABILITY

  III REQUIRES SYSTEM WITH 0.040 CAPABILITY
- AREAS NOT DEFINED REQUIRE SYSTEM WITH 0.070 CAPABILITY.



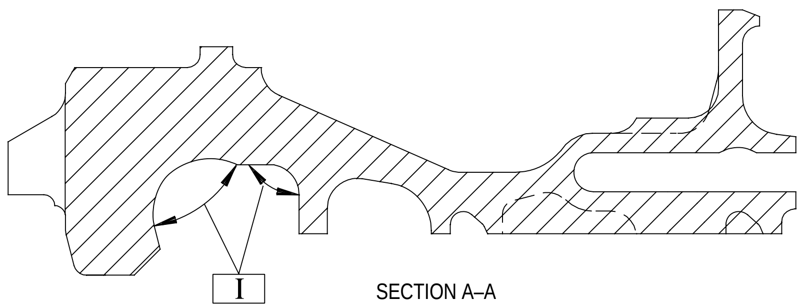


Figure 2. First Stage Turbine Blade Rear Retaining Plate Assembly - Required Fluorescent Penetrant System Capability

WORK PACKAGE

TECHNICAL PROCEDURES

DUCT AND SUPPORT SET - TURBINE, FIRST STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	26	4	26	7	20
2	13	5 - 6	13	8	26
3	16				

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T.O. No.	Date	Level	Title (ECP No.)
2J-F100229(VI)-507	27 Feb 1995	O/I	Remove and Replace First Turbine Duct and Support Set to Provide Increased Cooling and Higher Margin Material First Duct Segments For F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 94QA197)

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of first stage turbine duct and support set.

2. FIRST STAGE TURBINE DUCT AND SUPPORT SET - INSPECTION.

(See Figure 1.)

a. Ensure that first stage turbine duct and support set has been cleaned per WP 201 00.

b. See figure 1 for specific inspection areas and limits. Visually inspect for erosion and corrosion. Visually inspect duct segment especially for cracks in retaining corners and cooling holes, and for burning, corrosion, and nicks and dents caused by foreign object damage.

c. Fluorescent penetrant inspect first stage turbine duct and support set for cracks on a system currently qualified per MIL-STD-1823 at 90 percent probability of detection and 50 percent confidence level indication of 0.070 inch long. Refer to T.O. 2J-F100-9. No cracks allowed.

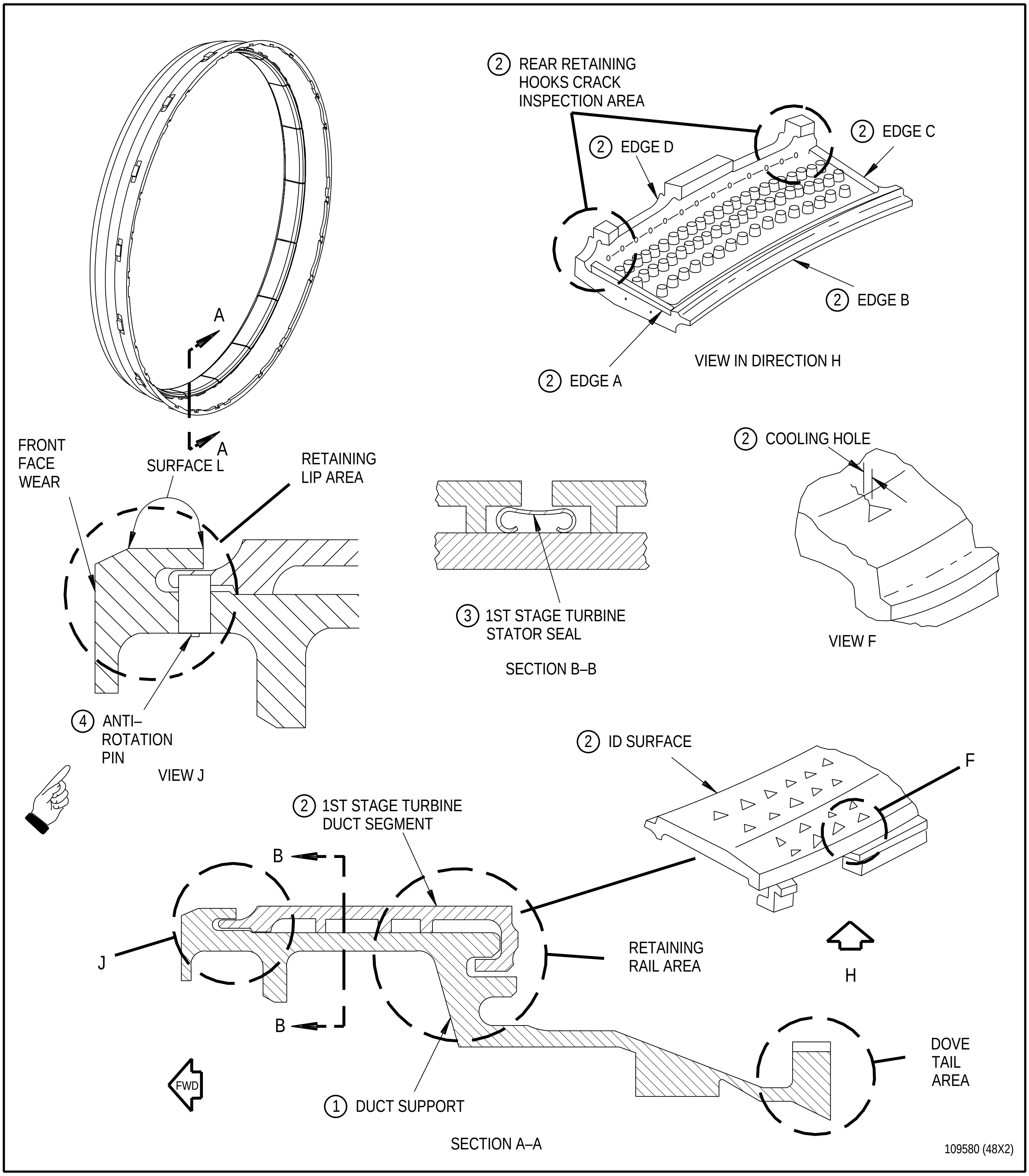


Figure 1. First Stage Turbine Duct and Support Set - Inspection (Sheet 1 of 2)

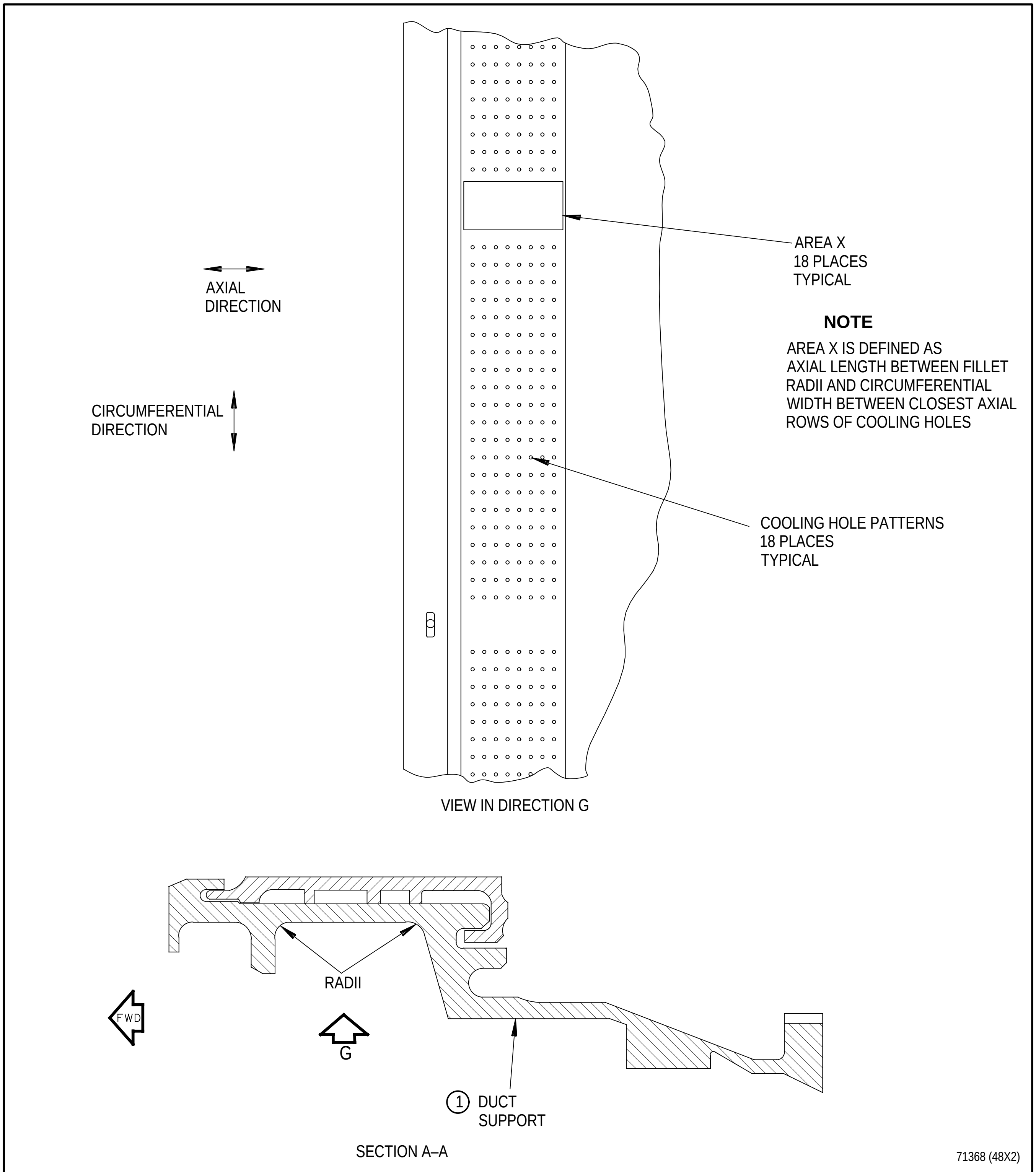


Figure 1. First Stage Turbine Duct and Support Set - Inspection (Sheet 2 of 2)

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Duct support -			
Cracks, front retaining lip	Any number of cracks on Surface L, provided no cracks extend across to front face	See corrective action	Replace duct and support set.
Dovetail and Retaining rail cracks	Not serviceable	Not reparable	Replace duct and support set.
Cracks originating from cooling holes	Not serviceable if crack length exceeds one hole diameter.	Not reparable	Replace duct and support set.
Area X cracks (18 locations) (Supports not incorporating TCTO 2J-F100229(VI)-507)	One axial crack up to 0.300 inch maximum length per location provided crack does not enter either forward or aft fillet radius. Up to two locations maximum.	Not reparable	Replace duct and support set.
	Any amount of circumferential cracks per location provided cracks do not extend out of discolored heat affected zone. Up to four locations maximum.	Not reparable	Replace duct and support set.
	A crack pattern that may link up and result in a loss of support material is cause for rejection.	Not reparable	Replace duct and support set.
Area X cracks (18 locations) (Supports incorporating TCTO 2J-F100229(VI)-507)	Not serviceable	Not reparable	Replace duct and support set.
Cracks, all other areas	Not serviceable	Not reparable	Replace duct and support set.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Duct support - (continued)			
Wear, front face	Up to 0.003 inch deep	Not reparable	Replace duct and support set.
Wear, all over	Up to 0.005 inch	Not reparable	Replace duct and support set.
Erosion, Surface L	Up to 0.030 inch deep serviceable	Not reparable	Replace duct and support set.
Erosion, other areas	Not serviceable	Not reparable	Replace duct and support set.
Nicks scratches	Up to 0.010 inch deep	Not reparable	Replace duct and support set.
Antirotation pin wear, loose, missing	Not serviceable	Not reparable	Replace pin.
2. First stage turbine duct segment -			
Cracks originating from cooling holes	Any amount provided no two holes are connected	See corrective action	Replace duct segment.
Cracks, rear retaining hooks	Not serviceable	Not reparable	Replace duct segment.
Cooling holes blocked	Serviceable	None	
Wear, all over	0.005 inch maximum	Not reparable	Replace duct segment.
ID surface -			
Cracks, axial	Not serviceable	See corrective action	Replace duct segment.
Cracks, circumferential	Not serviceable	See corrective action	Replace duct segment.
Pits, nicks, and dents	0.050 inch maximum diameter, up to 0.010 inch deep	Not reparable	Replace duct segment.
Rubs	Up to 0.025 inch deep serviceable	Not reparable	Replace duct segment.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. First stage turbine duct segment - (continued)			
Pits, nicks, and dents	0.050 inch maximum diameter, up to 0.010 inch deep	Not reparable	Replace duct segment per WP 406 00.
Rubs	Up to 0.025 inch deep serviceable	Not reparable	Replace duct segment per WP 406 00.
Erosion	Up to 0.010 inch deep serviceable	Not reparable	Replace duct segment per WP 406 00.
Erosion, edges A, and C	Up to 0.010 inch circumferentially is serviceable	Not reparable	Replace duct segment per WP 406 00.
Erosion, edges B, and D	Up to 0.010 inch axially is serviceable	Not reparable	Replace duct segment per WP 406 00.
3. First stage turbine stator seal -			
Missing, bent, erosion, dented	Not serviceable	See corrective action	Replace seals per WP 406 00.
4. Antirotation pin -			
Loose, missing	Not serviceable	See corrective action	Replace antirotation pin per WP 406 00.
Wear	Not serviceable	See corrective action	Replace antirotation pin per WP 406 00.

WORK PACKAGE

TECHNICAL PROCEDURES

RING ASSEMBLY - AIR SEALING, TURBINE, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	18	3	16	5	18
2	0	4	0	6 Blank	0

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 2nd stage turbine air sealing ring assembly.

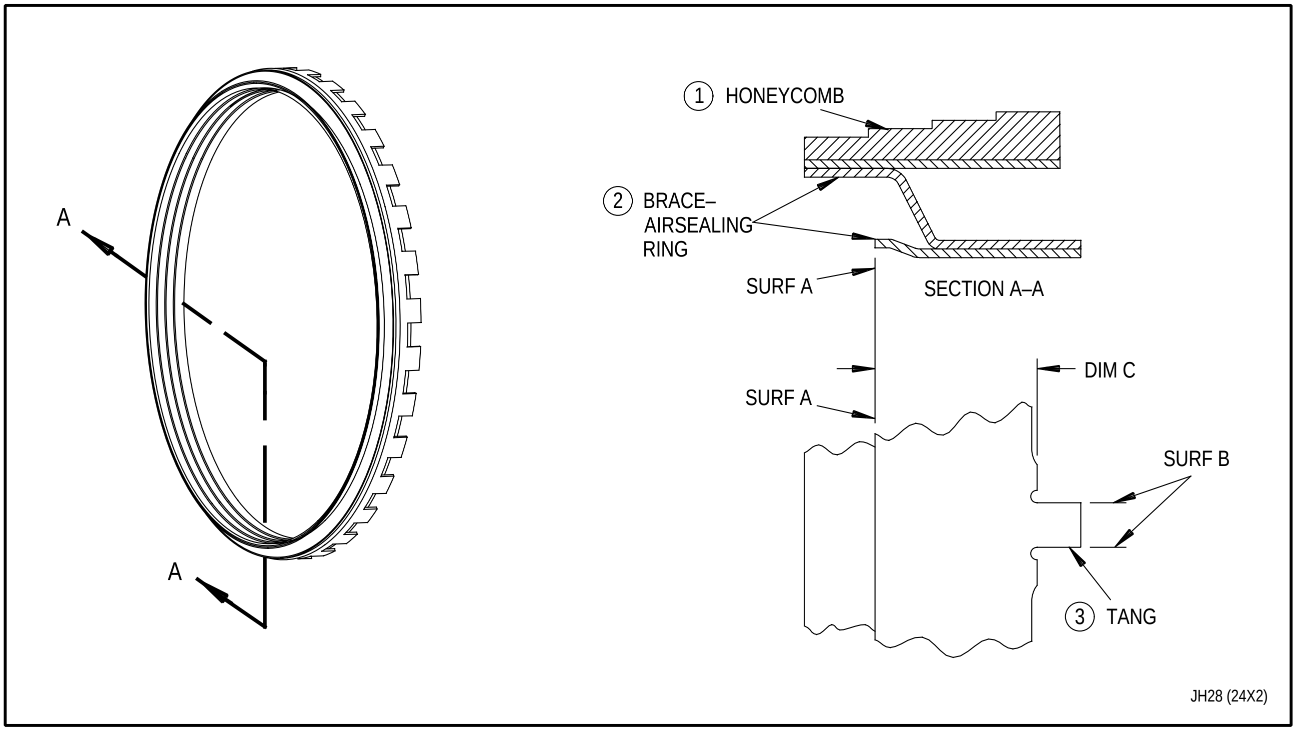
2. SECOND STAGE TURBINE AIR SEALING RING ASSEMBLY - INSPECTION.

(See Figure 1.)

a. Ensure that second stage turbine air sealing ring assembly has been cleaned per WP 201 00.

b. See figure 1 for specific inspection areas and limits.

c. Fluorescent penetrant inspect second stage turbine air sealing ring assembly for cracks on a system currently qualified per MIL-STD-1823 at 90 percent probability of detection and 50 percent confidence level to surface length indication of 0.070 inch long. Refer to T.O. 2J-F100-9. No cracks allowed.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Honeycomb -			
Damaged or missing cells	Up to 0.375 inch in width and 0.750 inch in circumferential length. No more than 2% (1.5 sq. in.) of total honeycomb area may be affected.	See corrective action	Replace air sealing ring assembly.
Wear, grooving	0.008 inch maximum depth for full circumference.	See corrective action	Replace air sealing ring assembly.

Figure 1. Second Stage Turbine Air Sealing Ring Assembly - Inspection

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Brace, air sealing ring -			
Cracks	Not serviceable	See corrective action	Replace air sealing ring assembly.
Wear - Surface -A-	Dimension C not less than 0.870 inch	See corrective action	Replace air sealing ring assembly.
Wear - Surface -B-	Up to 0.005 inch	See corrective action	Replace air sealing ring assembly.
3. Tang -			
Bent, distorted	Not serviceable	Any amount	Straighten with pliers.
Separation (gap) between sheet metal details	Visible gap between details allowable at end of tangs forward of seam weld. No cracking or separation of weld allowed.	Not reparable	Replace air sealing ring assembly.

WORK PACKAGE

TECHNICAL PROCEDURES

VANE - TURBINE STATOR, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	22	6	22	9	0
2 - 4	0	7	0	10	8
5	16	8	8	11 - 12	0

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine Parts - Cleaning	WP 201 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 2nd stage turbine stator vanes.

2. SECOND STAGE TURBINE STATOR VANE ASSEMBLY DISPOSITION GUIDELINES PRIOR TO DETAIL VANE INSPECTION.
(See Table 1.)

a. The following table is provided to assist in sorting turbine vane assemblies quickly into conditional catagories.

b. The catagories for part sorting are:

- Replacement
- Hold for future repair
- Hold for future coating repair

c. Vanes require relocating 100% prior to resources reqardless of distress.

Table 1. Second Stage Turbine Vane Assemblies - Disposition Guidelines

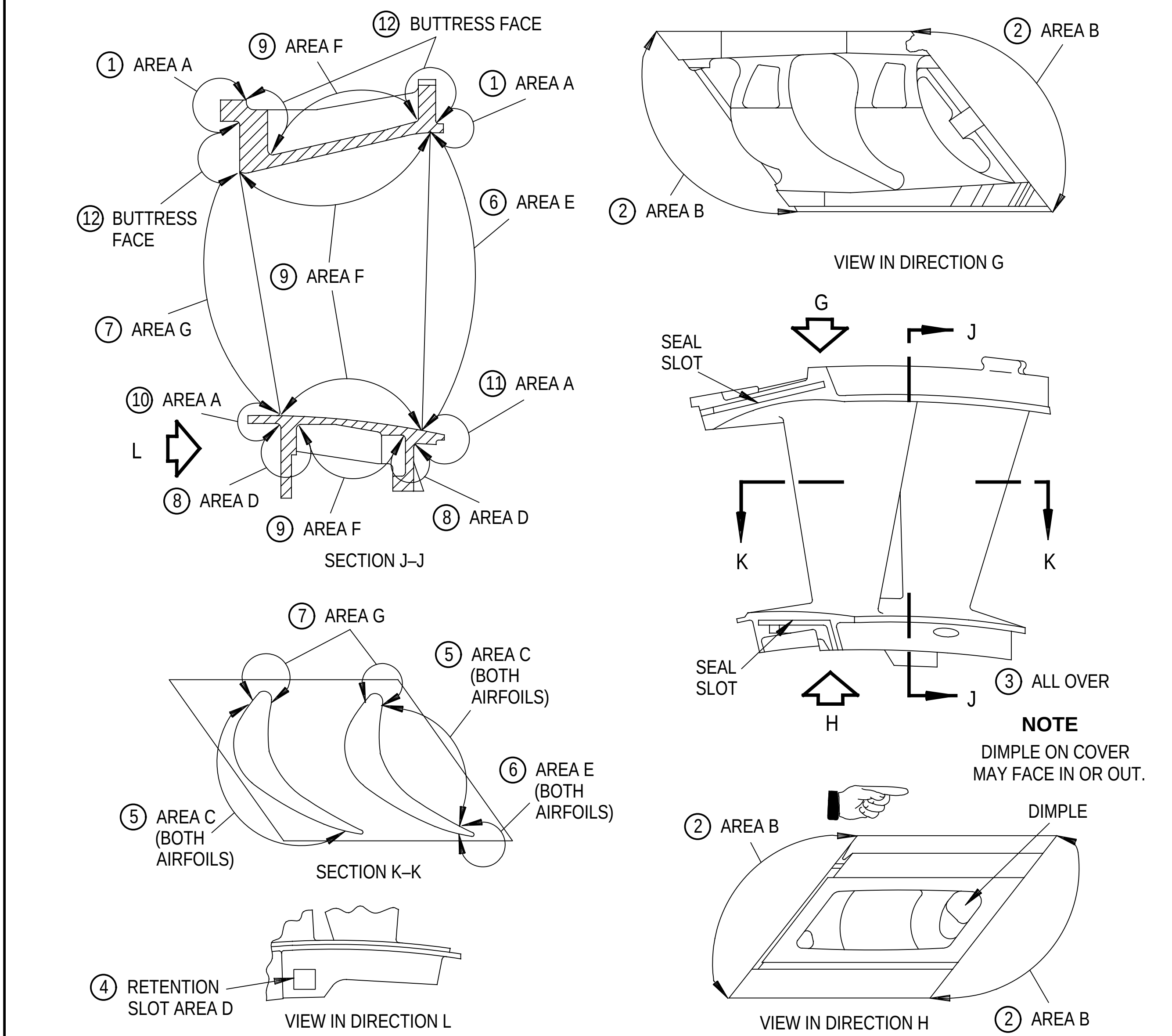
<table>
<tr><th>Condition</th><th>Disposition</th></tr>
<tr><td>No erosion, no crazing or cracks, minor slot wear.</td><td rowspan="2">Inspect. Refer to paragraph 3. Serviceable parts shall be held for future coating repair. Reparable parts shall be held for future repair.</td></tr>
<tr><td>Tight crazing, minor erosion, small cracks.</td></tr>
<tr><td>Large erosion (through airfoil, including leading edge or platform), or large cracks.</td><td>Replace vane assembly.</td></tr>
</table>

3. SECOND STAGE TURBINE STATOR VANE ASSEMBLY - INSPECTION
(See Figure 1.)

a. Ensure that second stage turbine stator vane assembly have been cleaned per WP 201 00.

b. Fluorescent penetrant inspect second stage turbine stator vane assembly forcracks on a system currently qualified per MIL-STD-1823 at 90 percent probability of detection and 50 percent confidence level to surface length indication of 0.070 inch long. Refer to T.O. 2J-F100-9. No cracks allowed.

c. See figure 1 for specific inspection areas and limits.



AREA A	INNER PLATFORM LEADING AND TRAILING EDGE. OUTER PLATFORM LEADING AND TRAILING EDGE.	AREA C	AIRFOIL (CONCAVE AND CONVEX SURFACES)	AREA F	INNER PLATFORM OUTER AND INNER SURFACES. OUTER PLATFORM INNER AND OUTER SURFACES
AREA B	INNER AND OUTER PLATFORM MATING FACES	AREA D	INNER VANE FEET (FRONT AND REAR)	AREA G	AIRFOIL LEADING EDGE
		AREA E	AIRFOIL TRAILING EDGE		

101520 (48X2)

Figure 1. Second Stage Turbine Stator Vanes - Inspection

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Area A (outer platform leading and trailing edge) -			
Axial cracks (See Note.)	a. Maximum of 3 are acceptable provided cracks do not extend into buttress or inner feet flat faces	See corrective action	Replace vane. Hold replaced vane for future weld repair.
	b. Cracks along edge up to 0.100 inch long and 0.031 inch wide are acceptable provided they are separated by 0.040 inch minimum		
2. Area B (inner and outer platform mating faces) -			
Cracks (See Note.)	a. One crack per edge extending from edge to airfoil/platform radius up to 0.250 inch long and 0.010 inch wide	See corrective action	Replace vane. Hold replaced vane for future weld repair.
	b. Cracks along edge are acceptable provided they are separated by 0.040 inch minimum and do not extend beyond depth of seal slots		

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Area B (inner and outer platform mating faces) - (continued)			
Burning, erosion	a. Up to 0.010 inch deep on inner platform outer surface side of seal slots and outer platform inner surface side of seal slots. b. Rounded edges provided radius does not extend past seal slots or into airfoil radius.	See corrective action	Replace vane.
3. All over, entire vane -			
Missing, worn, chipped, or crazed coating	Not serviceable (except inner and outer platform surfaces; see Inspection Area 9)	See corrective action	Replace vane.
4. Area D (retention slot) -			
Wear	Up to 0.005 inch deep - inside slot surface	See correcive action	Replace vane.
Cracks	Not serviceable	See corrective action	Replace vane.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Area C (vane concave, convex surfaces) -			
Cracks	Not serviceable	Not reparable	Replace vane.
Nicks, dents	Up to 0.187 inch diameter and 0.010 inch deep	See corrective action	Replace vane.
Burning, erosion	Not serviceable	See corrective action	Replace vane.
6. Area E (airfoil trailing edge) -			
Cracks and existing blends (See Note.)	Any number less than 0.250 inch long and separated by 0.125 inch.	Not reparable	Replace vane.
Nicks, dents	0.187 inch maximum diameter, 0.015 inch maximum depth.	Not reparable	Replace vane.
Chipping, burning	0.005 inch deep	Not reparable	Replace vane.
7. Area G (airfoil leading edge) -			
Cracks	Not serviceable	Not reparable	Replace vane.
Erosion, burning	Up to 0.005 inch deep along entire span (radial length)	See corrective action	Replace vane.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
7. Area G (airfoil leading edge) - (continued)			
Nicks, dents or impact damage	Up to 0.010 inch deep and up to 0.062 inch maximum diameter in up to 5 locations. Damage areas shall be separated by 0.125 inch.	See corrective action	Replace vane.
8. Area D (vane inner feet front and rear) -			
Cracks	Not serviceable	See corrective action	Replace vane.
Wear	0.015 inch maximum depth	See corrective action	Replace vane.
9. Area F (Inner platform, inner and outer surfaces. Outer platform, inner and outer surfaces) -			
Cracks (See Note.)	None allowed	See corrective action	Replace vane.
Nicks, dents	0.250 inch maximum diameter, 0.015 inch maximum depth	See corrective action	Replace vane.
Missing or blocked holes	Not serviceable	See corrective action	Replace vane.
Missing thermal barrier coating	Outer platform up to 1.00 square inch total area. Inner platform up to 0.500 square inch total area but not within 0.100 inch of platform edges.	See corrective action	Replace vane.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action

NOTE

Intersection of cracks in leading edge, trailing edge, platform or airfoil which may result in loss of any section of vane is cause for rejection.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
10. Area A (inner platform leading edge) -			
Nicks and dents	Not serviceable	See corrective action	Replace vane.
Rub	Grooves up to 0.015 inch deep and 0.030 inch wide	See corrective action	Replace vane.
Cracks	Not serviceable	See corrective action	Replace vane.
11. Area A (inner platform trailing edge) -			
Rub (2nd stage turbine blade)	Rub may extend to within 0.080 inch of inner vane foot	See corrective action	Replace vane.
Cracks	Not serviceable	See corrective action	Replace vane.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
12. Buttress faces -			
Cracks/ Erosion	0.050 inch maximum length, 0.010 inch maximum width, and 0.010 inch maximum depth.	See corrective action	Replace vane. Hold replaced vane for future weld repair.
Wear	0.005 inch maximum depth	See corrective action	Replace vane. Hold replaced vane for future weld repair.

NOTE

Intersection of cracks in leading edge, trailing edge, platform, or airfoil which may result in loss of any section of vane is cause for rejection.

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE ASSEMBLY - RETAINING, BLADE, TURBINE, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Nondestructive Inspection - General Information	SWP 004 01
Nondestructive Inspection Procedure (Repetitive) - Eddy Current	SWP 004 09
Plate, Retaining, Blade, Turbine, Rear, Second Stage - Inspection	SWP 532 01
Rear Compressor Drive Turbine Parts	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine Parts - Cleaning	WP 201 00
Plate, Retaining, Blade, Turbine, Second Stage - Repair	WP 409 00
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00
Nondestructive Evaluation System Reliability Accessment	MIL-HDBK-1823

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 2nd stage turbine blade retaining plate assembly.

2. SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - INSPECTION.

(See Figures 1 and 2.)

a. Ensure that second stage turbine blade retaining plate assembly has been cleaned per WP 201 00.

b. See figure 1 for visual and dimensional areas and limits.

NOTE

Inspect knife-edge seals by fluorescent penetrant inspection method only if coating is removed until ECI capability is available.

c. Fluoresent penetrant inspect second stage turbine blade retaining plate assembly for cracks on system with capablilty defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed.

d. Eddy current inspect second stage turbine blade retaining plate assembly per paragraph 3. Refer to T.O. 2J-F100-9.

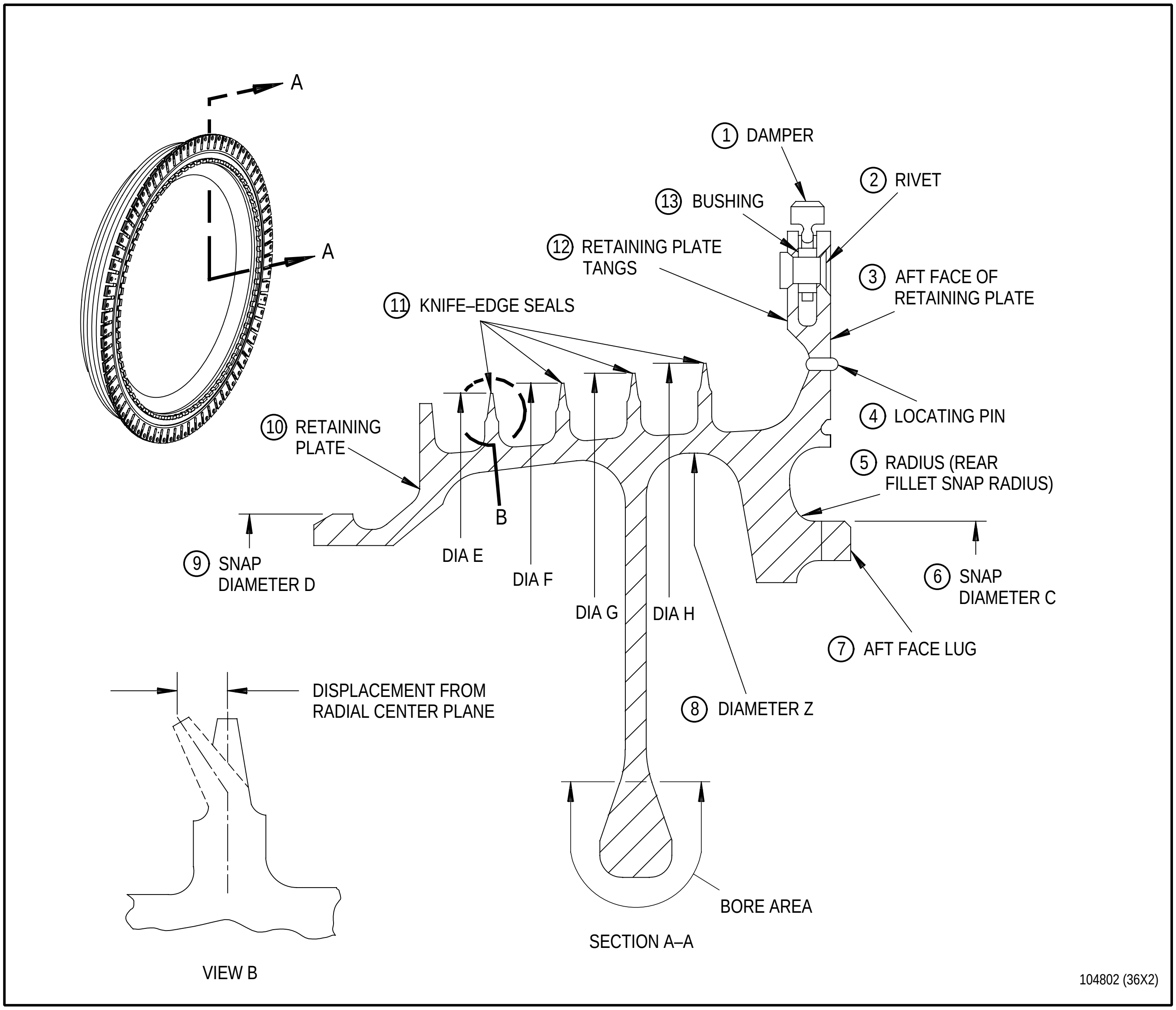


Figure 1. Second Stage Turbine Blade Retaining Plate Assembly - Inspection (Sheet 1 of 2)

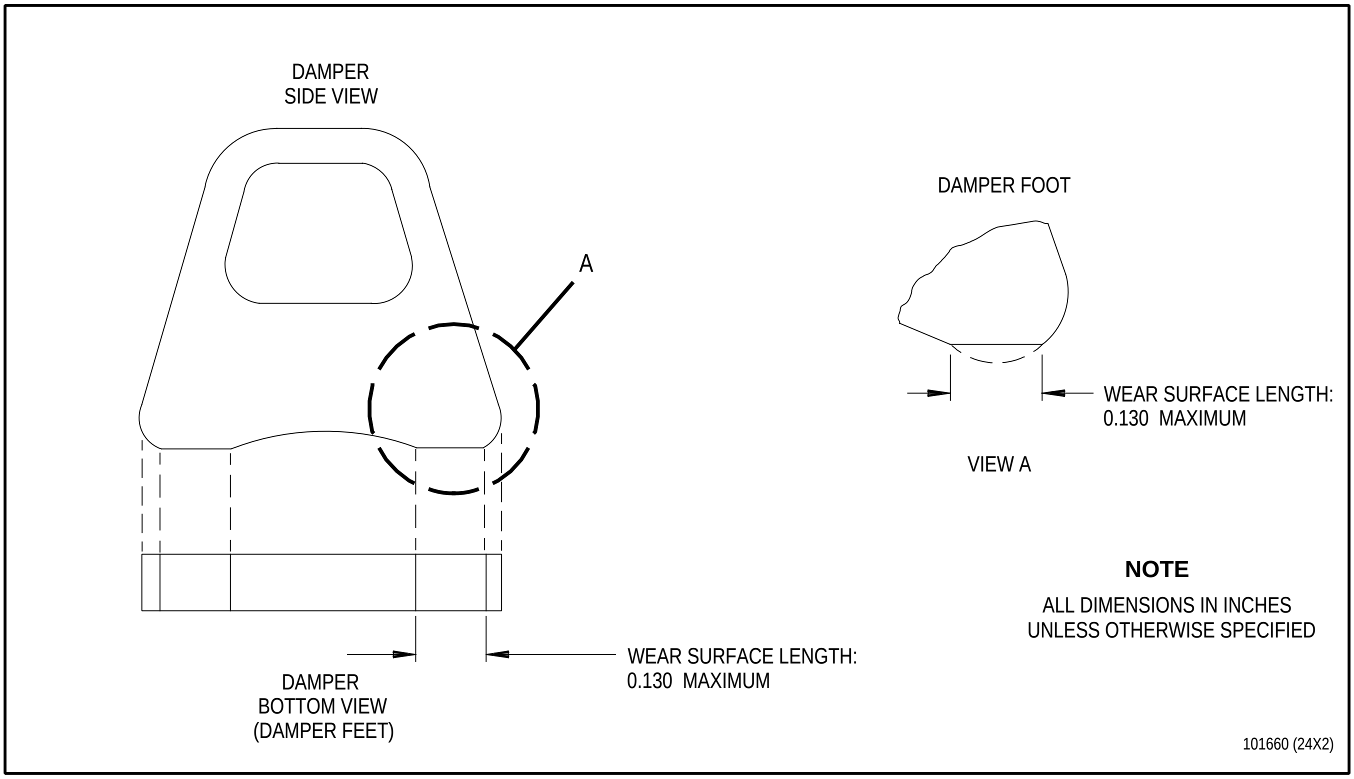


Figure 1. Second Stage Turbine Blade Retaining Plate Assembly - Inspection (Sheet 2 of 2)

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Damper -			
Missing, cracked	Not serviceable	See corrective action	Replace damper per WP 409 00.
Wear	Not serviceable	See corrective action	Replace dampers per WP 409 00.
Freedom of movement	Damper shall be free to move	See corrective action	Inspect for bent retaining plate tangs. If tangs are not bent, replace rivet bushing and damper per WP 409 00.
2. Rivet -			
Cracked, missing	Not serviceable	Not reparable	Replace rivet per WP 409 00.
3. Aft face of retaining plate -			
Wear	Serviceable	Any amount	Not required
4. Locating pin -			
Broken, bent, or missing	Not serviceable	Not reparable	Replace retaining plate assembly.
5. Rear fillet snap radius -			
Suspected cracks via fluorescent penetrant inspection	Not serviceable	Not reparable	Replace retaining plate assembly.
6. Snap diameter C -			
Wear	15.957 to 15.965 inch diameter	Not reparable	Replace retaining plate assembly.
7. Aft face lug -			
Nicks, dents	Not serviceable	0.005 inch deep	Blend repair per WP 409 00.
8. Diameter Z -			
Stretch	Not serviceable	Not reparable	Replace retaining plate assembly.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
9. Diameter D -			
Wear	16.031 to 16.038 inch diameter	Not reparable	Replace retaining plate assembly
10. Retaining plate -			
Cracks	Not serviceable	Not reparable	Replace retaining plate assembly.
Nicks, dents, scratches	Not serviceable	Not reparable	Replace retaining plate assembly.
11. Knife-edge seals -			
Wear	Average minimum serviceable diameters: Diameter E: 17.246 inches Diameter F: 17.346 inches Diameter G: 17.446 inches Diameter H: 17.546 inches	Not reparable	Replace retaining plate assembly.
Bent	0.500 inch in length per knife-edge. 0.050 inch maximum displacement from radial center plane.	Damage is reparable if final blend meets blend limits in WP 409 00.	Blend repair per WP 409 00.
Nicks and Dents	Not serviceable	Damage is reparable if final blend meets blend limits in WP 409 00.	Blend repair per WP 409 00.
Cracks	Not serviceable	Not reparable	Replace retaining plate assembly.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
11. Knife-edge seals - (continued)			
Chipped or missing coating	Visible as lost top coating missing from bond coat layer by defined lines of demarcation. See figure 1A. Coating may be chipped or missing in up to six 0.250 inch long areas, but shall be separated by at least one inch per knife-edge.	Not reparable	Replace retaining plate assembly.
12. Retaining plate tangs -			
Bent	Not serviceable	Not reparable	Replace retaining plate assembly.
13. Bushing -			
Missing, or if found damaged when repairing or replacing other parts	Not serviceable	Any amount	Replace bushing per WP 409 00.

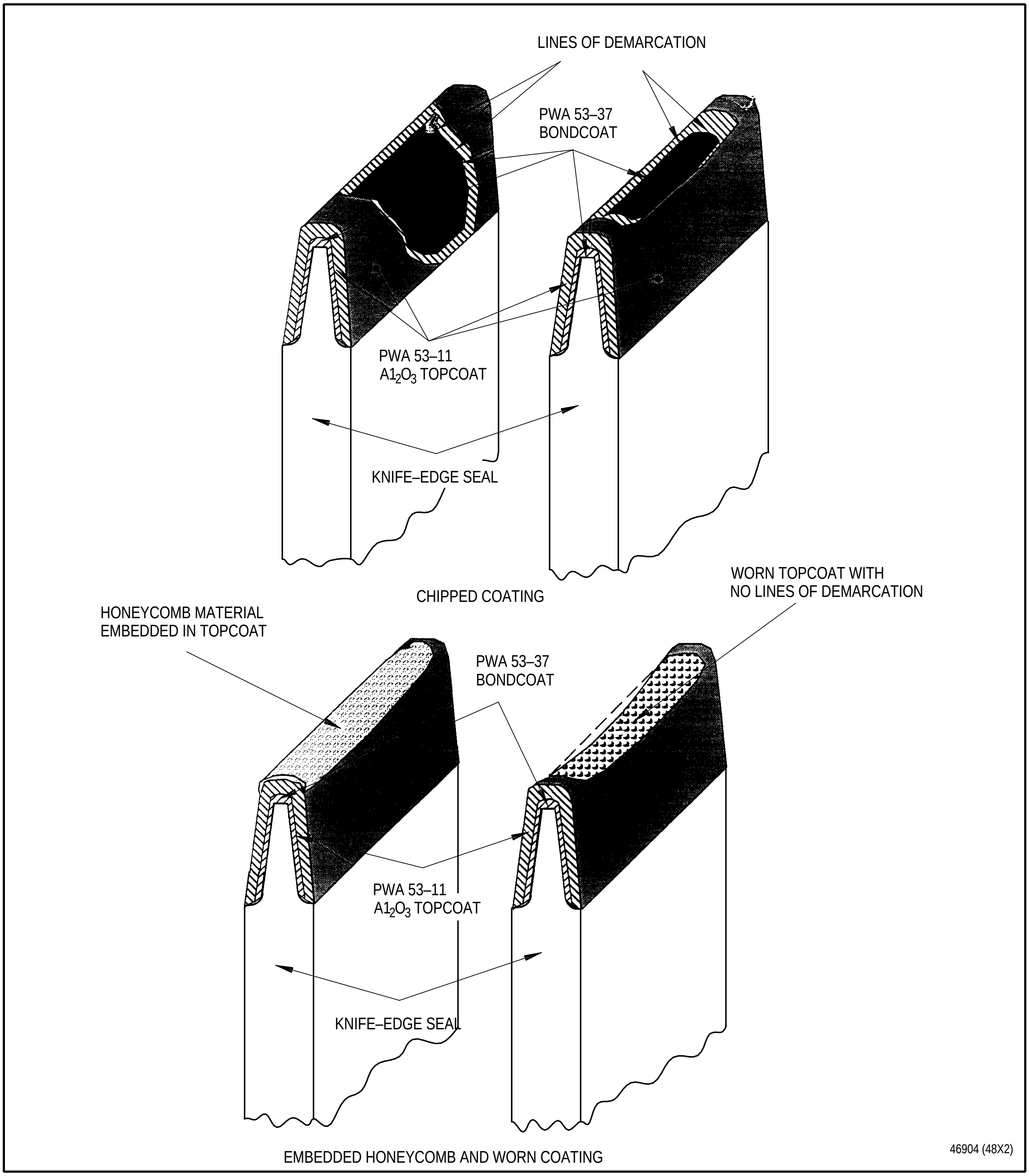


Figure 1A. Second Stage Turbine Blade Retaining Plate Assembly - Chipped Coating, Embedded Honeycomb, and Worn Coating

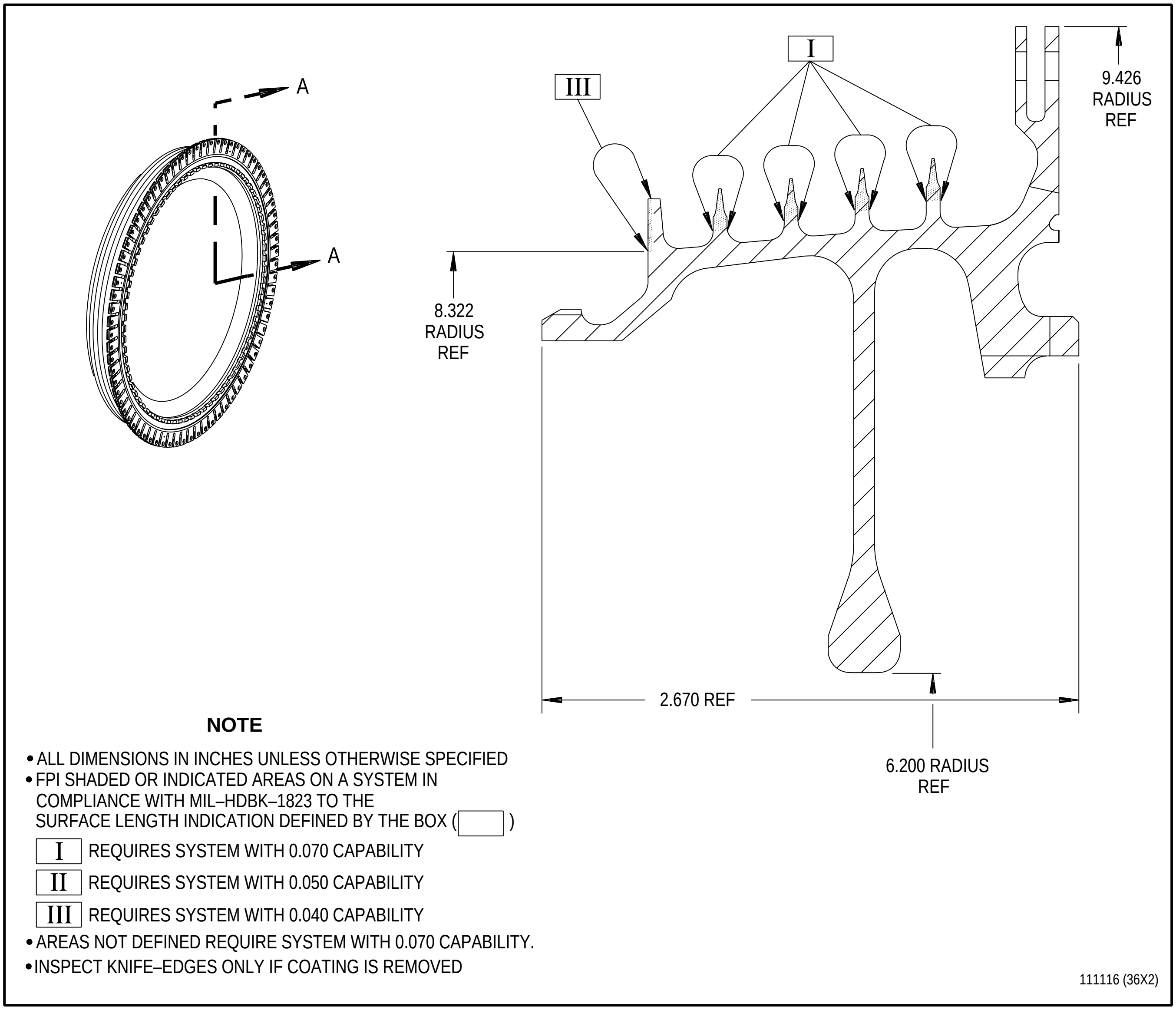


Figure 2. Second Stage Turbine Blade Retaining Plate - Required Fluorescent Penetrant System Capability

3. EDDY CURRENT INSPECTION USING PN 112366, FULLY AUTOMATED EDDY CURRENT INSPECTION STATION VERSION 3 FOR SECOND STAGE TURBINE BLADE RETAINING PLATE PN 4070147 AND PN 4079623.
(See Figure 3.)

a. Ensure retaining plate has been cleaned per WP 201 00

NOTE

- Knife-edges require ECI inspection only if coating is removed.
- FPI knife-edges until ECI capability is available.
- Full hoop next to forward slots ECI inspection is optional, operator selectable.

b. Prepare ECIS and part for inspection. Refer to T.O. 2J-F100-9, SWP 004 09, and SWP 532 01.

c. Inspect PN 4070147 and PN 4079623. Refer to T.O. 2J-F100-9, SWP 532 01.

d. Evaluate inspection results. See figure 3.

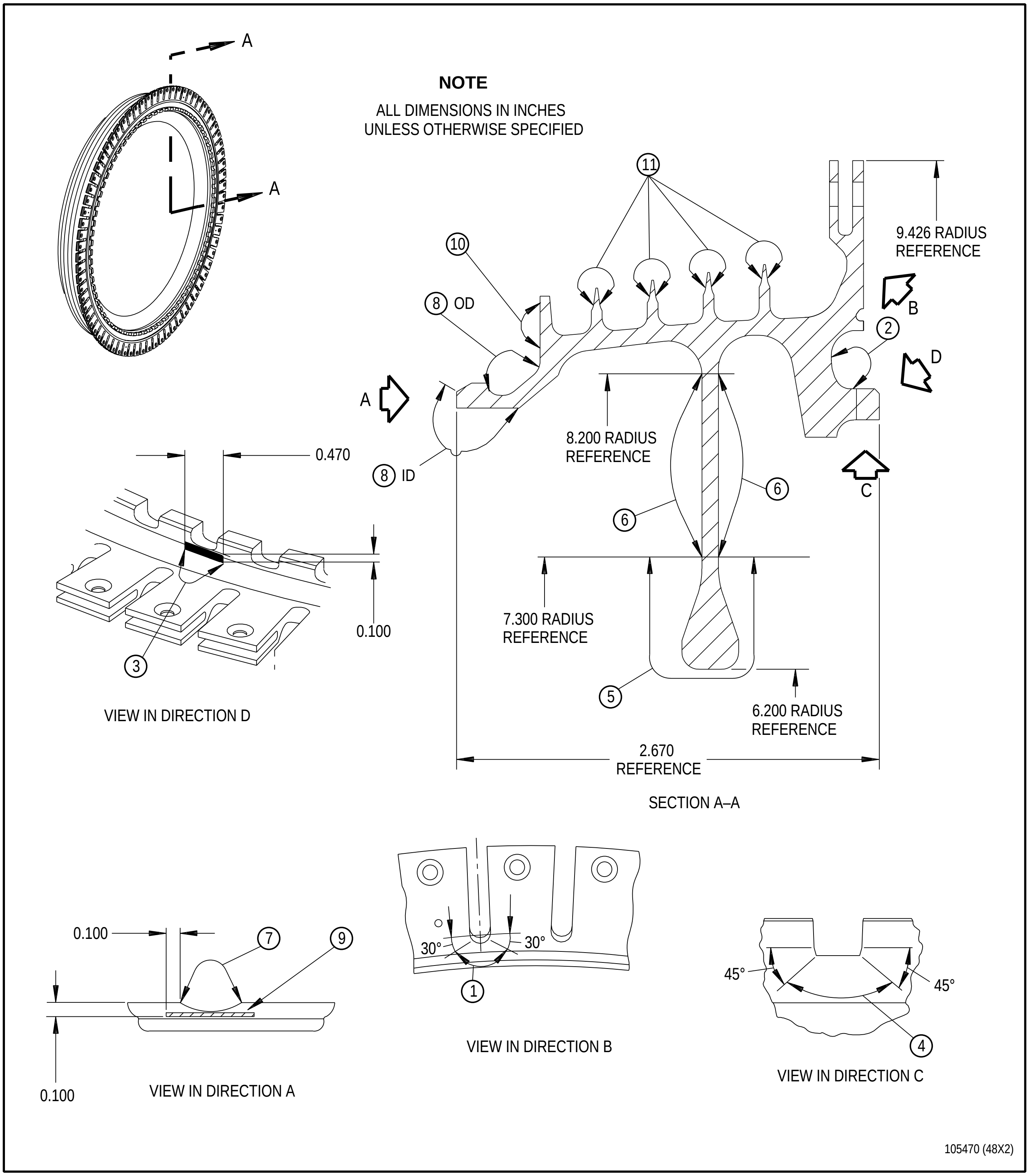


Figure 3. Second Stage Turbine Blade Retaining Plate - Eddy Current Inspection

Legend for figure 3

Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	ECIS System Rejection Limits Threshold (Counts)	a50 (Inch)	Corrective Action
1. Radial standup slots, 72 places	0.023	Axial, Radial	578	0.0148	Replace retaining plate.
2. Aft radius	0.015	Axial, Circumferential	3185	0.0137	Replace retaining plate.
3. Full hoop next to aft slots	0.035	Axial, Circumferential	3185	0.0137	Replace retaining plate.
4. Aft air slots, 72 places	0.022	Axial, Radial	383	0.0151	Replace retaining plate.
5. Bore area	0.008	Axial, Radial	935	0.0074	Replace retaining plate.
6. Web area					
Forward side -	0.020	Radial	4446	0.0149	Replace retaining plate.
Aft side -	0.020	Radial	3684	0.0147	
7. Forward air slots, 34 places	0.010	Axial, Radial	476	0.0084	Replace retaining plate.
8. Forward arm					
I.D. -	0.010	Axial, Radial	1537	0.0092	Replace retaining plate.
O.D. -	0.007	Axial, Radial	694	0.0065	
9. Full hoop next to forward slots	0.010	Radial, Circumferential	1381	0.0091	Replace retaining plate.
10. Forward face	0.020	Radial, Circumferential	3009 3093	0.0143 0.0147	Replace retaining plate.
11. Knife-edges	0.035	Axial, Radial	TBD	TBD	Replace retaining plate.

*Eddy current inspect on system in compliance with MIL-HDBK-1823.

WORK PACKAGE

TECHNICAL PROCEDURES

BLADE - TURBINE ROTOR, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 16

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	20	2B Blank Added	20	4 - 13	17
2	17	3	20	14 Blank	17
2A Added	20				

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- - - - - - - - - - - - - - - - - - - -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

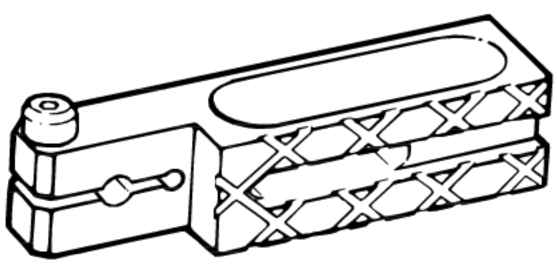
EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

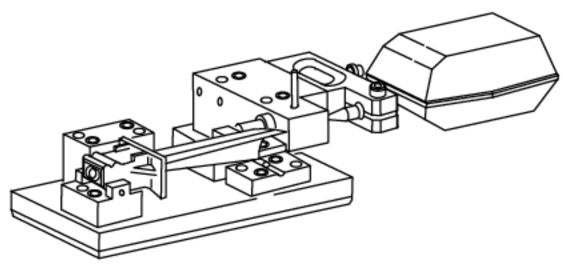
Paragraph	Function - Tool Nomenclature	Tool Number
3	Second Stage Turbine Rotor Blade Assembly - Stretch Measurement	
	Gage, Stretch, 2nd stage turbine blade -	PWA 57138
	Holder, Dial indicator - - - - - - - - - - - -	PWA 17019

ILLUSTRATED SUPPORT EQUIPMENT



PWA 17019 –C

Figure T1. PWA 17019 Holder



PWA 57138 –C

Figure T2. PWA 57138 Gage

1. INTRODUCTION.

a. This work package contains instructions for inspection of 2nd stage turbine rotor blades.

2. SECOND STAGE TURBINE ROTOR BLADES - INSPECTION.

(See Figures 1 through 4.)

a. Ensure second stage turbine rotor blades have been cleaned per WP 201 00.

b. See figures 1 and 4 for specific inspection areas and limits. See figures 2 and 3 for examples of typical damage.

c. Fluorescent penetrant inspect second stage turbine rotor blades for cracks on a system currently qualified per MIL-STD-1823 at 90 percent probability of detection and 50 percent confidence level to surface length indication of 0.070 inch long. Refer to T.O. 2J-F100-9. No cracks allowed.

d. Perform inspections if any second stage turbine blades are found liberated or partially missing. Refer to T.O. 2J-F100-53-2, WP 037 00, Table 1.

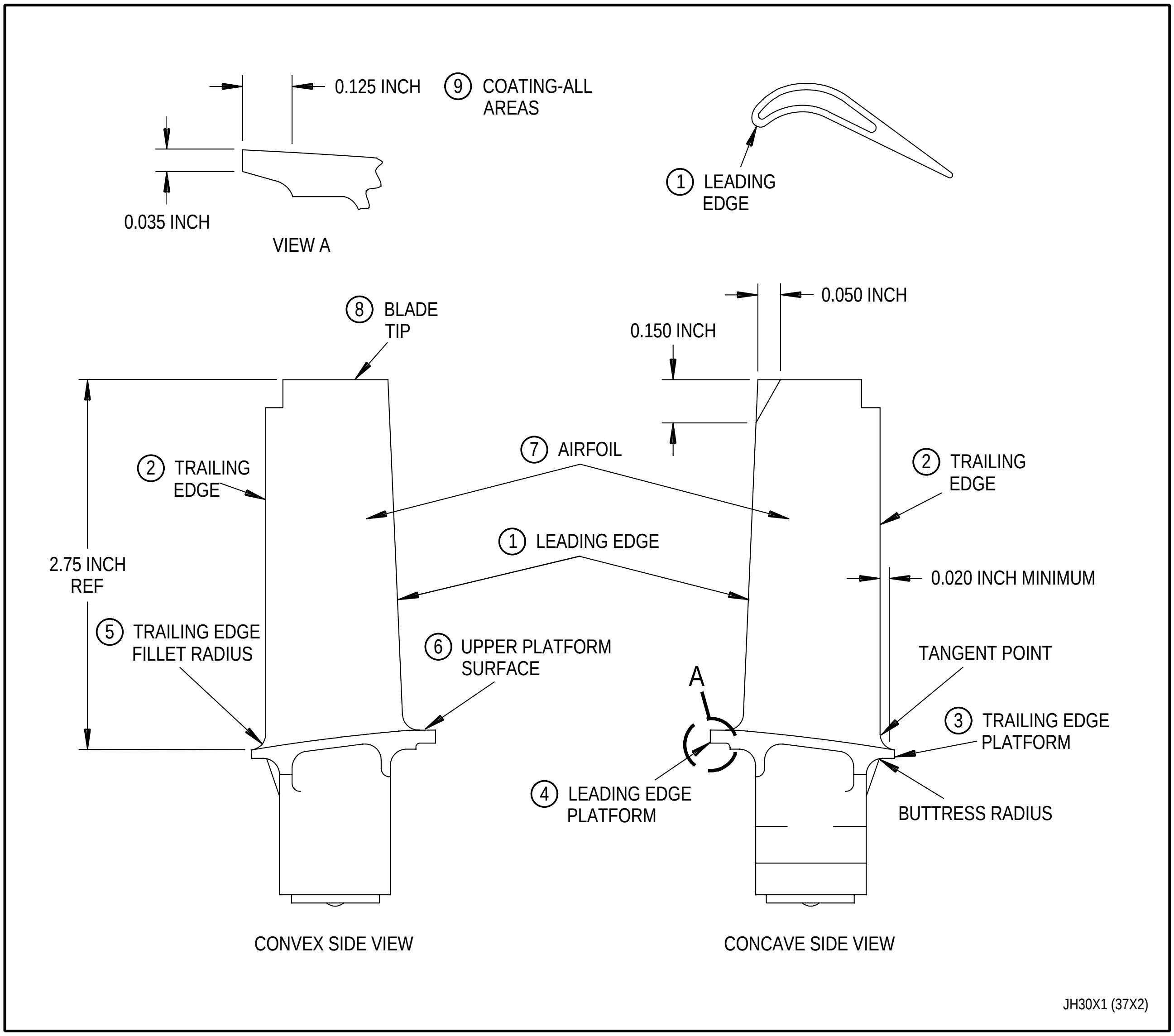


Figure 1. Second Stage Turbine Rotor Blades - Inspection

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Leading edge -			
Dents, nicks, impact damage	Maximum of two round-bottomed imperfections 0.030 inch maximum surface dimension and up to 0.010 inch deep except no damage allowed within 0.500 inch of platform	Not reparable	Replace blade.
Cracks	Not serviceable	Not reparable	Replace blade.
Erosion	Not serviceable	Not reparable	Replace blade.
Rub at tip	0.150 inch long and 0.050 inch deep. No cracks allowed.	Not reparable	Replace blade.
2. Trailing edge -			

NOTE

Only 1 blend allowed from platform to midspan. 3 blends allowed from mid-span to tip. Maximum of 4 blends for any type of damage per blade. Minimum separation of 0.500 inch between blends.

Dents, nicks, other impact damage	Maximum of three round-bottom imperfections. 0.030 inch surface dimension and 0.010 inch deep, except no damage allowed within 0.500 inch of platform.	Not reparable	Replace blade.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
2. Trailing edge - (continued)			
Cracks	Not serviceable	Not reparable	Replace blade.
Rub	Not serviceable	Not reparable	Replace blade.
3. Trailing edge platform -			
Rub	0.040 inch minimum platform thickness. 0.020 inch minimum trailing edge dimension shall be maintained. No rub permitted on airfoil side of platform and in buttress radius. No pieces missing from platform. No cracks allowed.	Not reparable	Replace blade.
4. Leading edge platform -			
Rub	See View A, figure 1. No cracks allowed. Minimum thickness of leading edge is 0.035 inch measured 0.125 inch aft of existing leading edge.	Not reparable	Replace blade.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Trailing edge fillet radius -			
Nicks, dents	Up to 0.030 inch in diameter and 0.005 inch deep. Maximum of one round bottom imperfection.	Not reparable	Replace blade.
6. Upper platform surface -			
Nicks, dents	Five imperfections 0.030 inch maximum diameter by 0.005 inch in depth each	Not reparable	Replace blade.
Cracks	Not serviceable	Not reparable	Replace blade.
7. Airfoil -			

NOTE

If condition of airfoil requires inspection of airfoil coating, perform within 24 hours of cleaning. Refer to T.O. 2J-F100-53-8, WP 320 00 for procedure on cleaning and inspection of PWA 275 coating.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
Nicks, dents	(a) Not Serviceable within 0.500 inch of platform	Not reparable	Replace blade.
	(b) Two imperfections per side, 0.062 inch surface dimension, 0.010 inch deep and no closer than 0.750 inch from tip. Imperfections shall also be clearly separated.	Not reparable	Replace blade.
	(c) Two imperfections per side on remainder of airfoil, 0.030 inch surface dimension, 0.010 inch deep clearly separated, if within 0.750 inch from tip.	Not reparable	Replace blade.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
7. Airfoil - (continued)			

NOTE

- Blade necking or rippling occurs slightly below airfoil midspan (approximately 3/4 inch above platform) and is characterized by airfoil stretch and reduced cross-sectional area. An example is depicted in Figure 2.
- Some blade airfoils may exhibit dimpling similar in appearance to surface of a golf ball. This condition will usually cover entire span of airfoil, and is considered acceptable.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
Necking or rippling	Not serviceable	Not reparable	Perform overtemperature inspection per T.O. 2J-F100-56-2, WP 003 00.
Erosion, minor burning	Not serviceable	Not reparable	Replace blade
Foreign material splatter	Serviceable up to 0.010 inch high.	Not reparable	Replace blade.
Cracks in all areas (including radii)	Not serviceable	Not reparable	Replace blade.
Blade-stretch. See paragraph 3 for measuring procedure.	0.010 inch maximum	Not reparable	Replace blade.
No pocket visible	Not serviceable	Not reparable	Replace blade.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
8. Blade tip -			
Nicks, dents	Maximum of three up to 0.062 inch radial length and 0.031 inch deep, clearly separated	Not reparable	Replace blade.
Cracks	Not serviceable	Not reparable	Replace blade.
Erosion	Not serviceable	Not reparable	Replace blade.
Wear, Rub	Serviceable if tip pocket is visible	See corrective action	Reject and scrap blades which do not exhibit a tip pocket.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
9. Coating - all areas (airfoil and outer platform surface) -			

NOTE

Peeling, flaking, or blistering of coating on blade airfoils indicates blades may have been subjected to overtemperature condition. Temperature analysis shall be performed on these blades.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
Flaking, peeling or blistering	Not serviceable	Not reparable	Perform overtemperature inspection per T.O. 2J-F100-56-2, WP 003 00.

NOTE

Coating crazing consists of many small, crack-like indications, aligned axially, radially, or in spider-web pattern. Usually found on concave surface of airfoil and platform, crazing is only present in the coating, with indications having no apparent width or depth. See figure 3. Coating craze should not be confused with fatigue style cracks, which have both width and depth, extend through coating into base material, and are usually accompanied by erosion.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
Coating crazing	Serviceable except none allowed within 0.500 inch of platform or in airfoil-to-platform fillet radius.	Not reparable	Replace blade.
Coating missing	Not serviceable	Not reparable	Replace blade.

NOTE

Pits, porosity and voids are all imperfections which occur during original part manufacture, and should be ignored during part inspection. They are different from nicks, dents, and impact damage, which occur after part manufacture during engine operation.

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
Pits, porosity, voids	Serviceable	Not required	Not required
Marks, scratches, and coating disconti- nuities in convex airfoil	Serviceable; however, additional cleaning is recommended. See corrective action.	Not reparable	Replace blade.

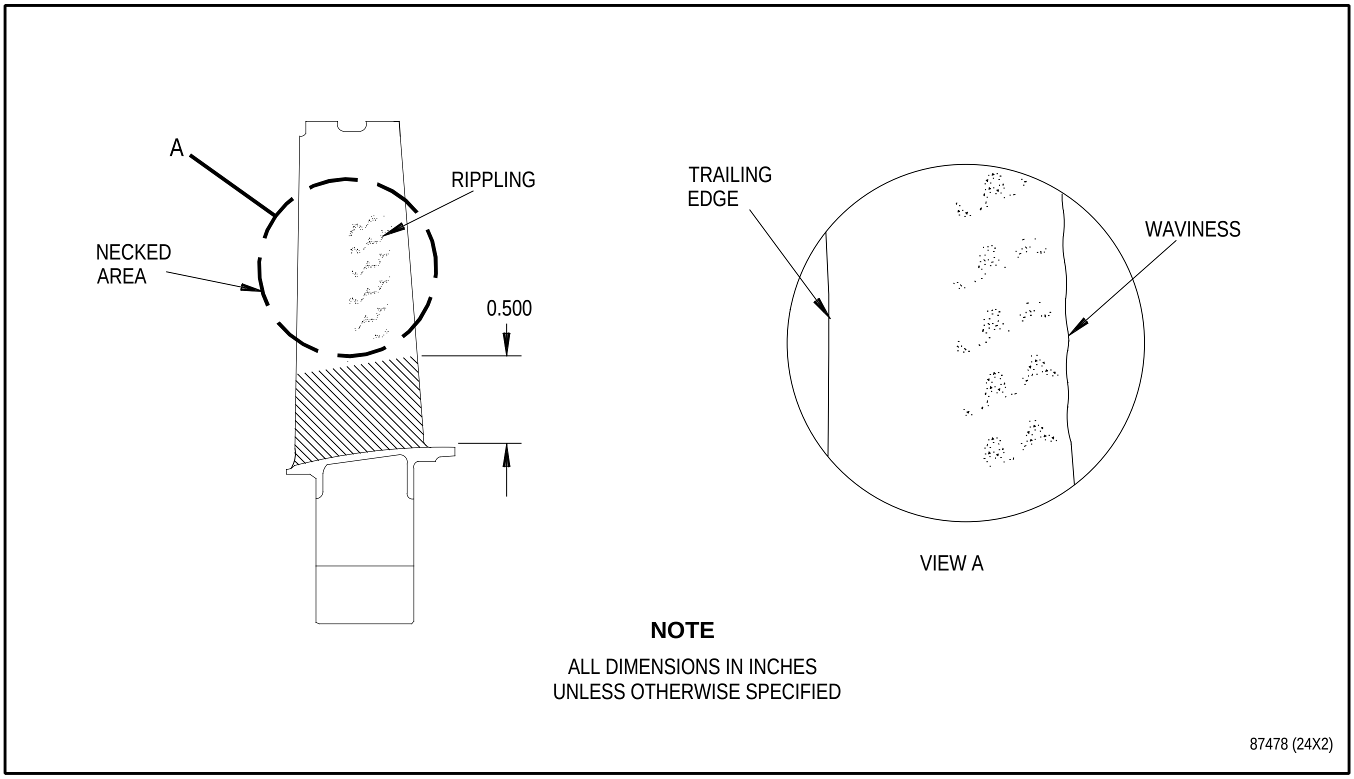


Figure 2. Second Stage Turbine Rotor Blades - Necking and Rippling

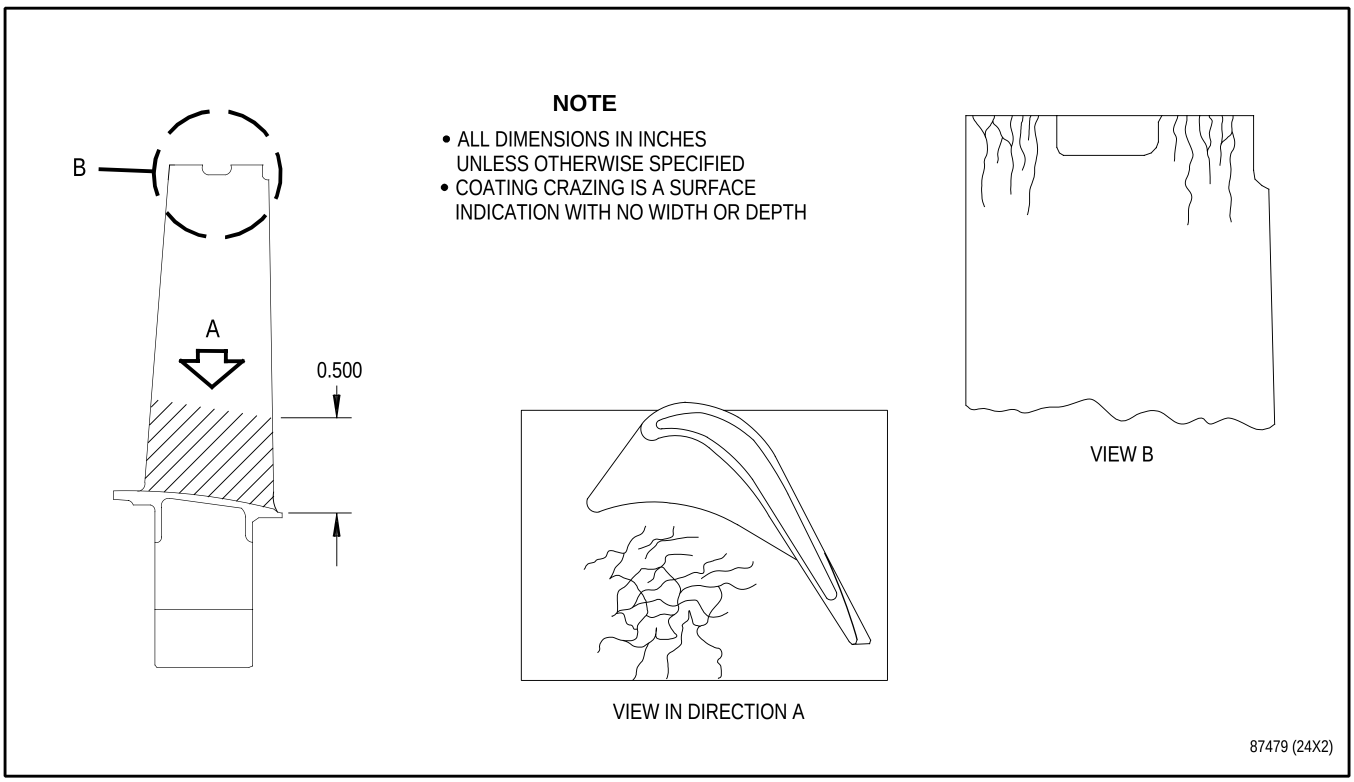
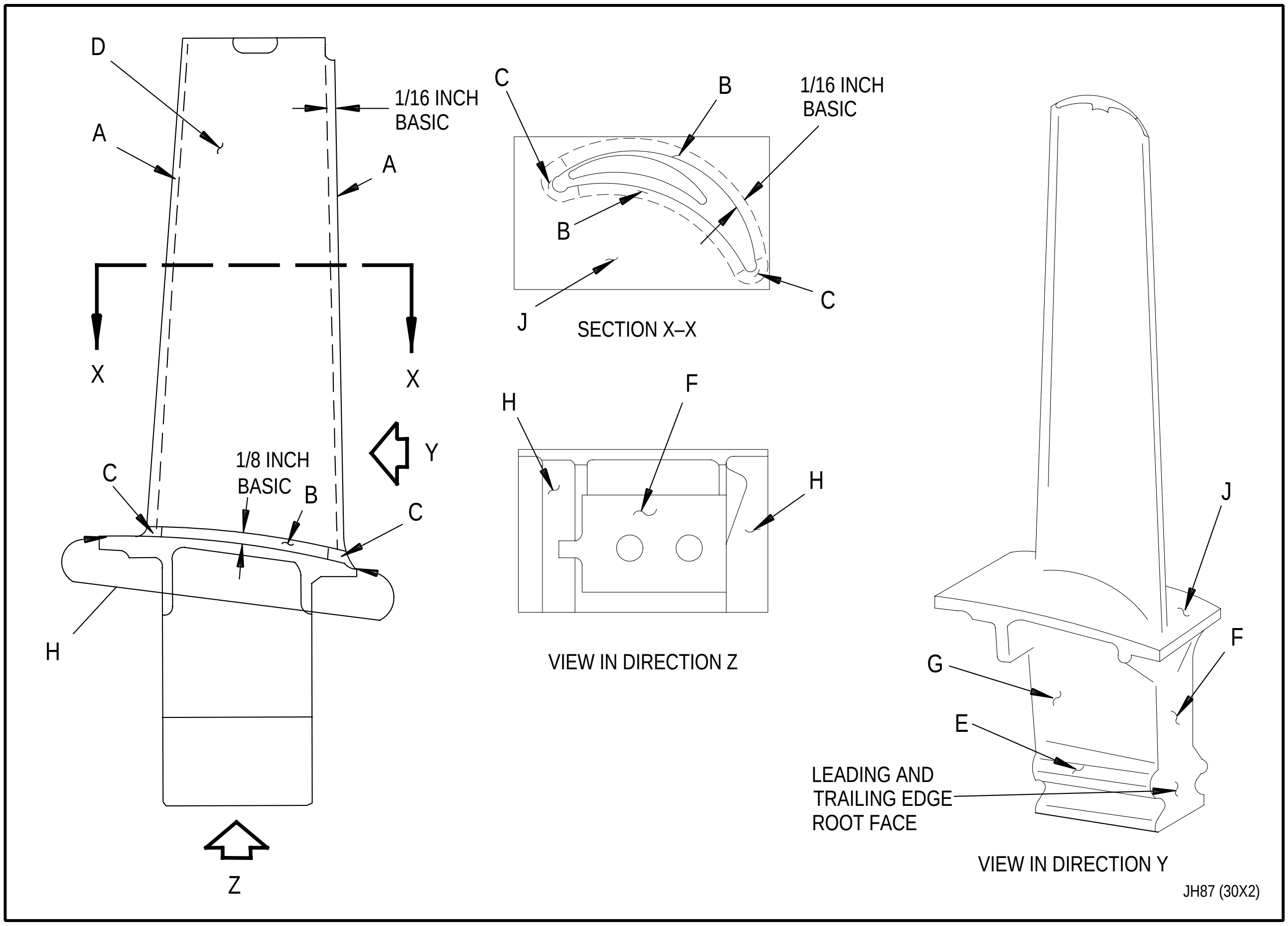


Figure 3. Second Stage Turbine Rotor Blades - Typical Views of Coating Crazing



Area	Maximum Quantity	Minimum Separation (Inch)	Maximum Dimension (Inch)
A	4 per edge	0.125	0.020
B	4 per side	0.250	0.030
	plus 4 total	Clearly Separated	0.015
	plus 1 linear imperfection per side except on convex airfoil no more than 0.500 inch from edge or 0.250 inch trailing edge.	0.125 from any other imperfection	0.060

Figure 4. Second Stage Turbine Rotor Blade - Nondestructive Inspection Areas and Limits

Legend for figure 4 (continued)

Area	Maximum Quantity	Minimum Separation (Inch)	Maximum Dimension (Inch)
C	4 total	Clearly Separated	0.015
D	10 per side (See note 1.)	0.125	0.030
E	Unlimited indications no cracks allowed	0.050	0.015
F	4 per side	0.0250	0.050
	plus 3 total (See note 2.)	Clearly Separated	0.020
G	4 per side	0.125	0.030
	plus 3 per side (See note 2.)	Clearly Separated	0.020
H	10 per blade	0.125	0.060
	plus 3 total	Clearly Separated	0.020
	plus 1 linear imperfection per side No cracks allowed (See note 2.)	0.125	0.090
J	5 total	0.125	0.060
	plus 3 total	Clearly Separated	0.020
	plus 1 area 0.250″ x 0.500″ of unlimited imperfections not in linear alignment (See note 2.)	Clearly Separated	0.015

NOTE

- All indications less than 0.010 inch in diameter are acceptable at any location.
- All indications on tip surface are acceptable.

1. On convex side, any indication shall be no closer than 0.250 inch from platform.
2. Except these imperfections shall be no closer than 0.045 inch from any fillet or edge radii.

3. SECOND STAGE TURBINE ROTOR BLADE - STRETCH MEASUREMENT. (See figure 1.)

a. Set dial of PWA 57138 stretch gage to zero, and set dial to zero, with dial indicator point contacting gaging surface.

b. Install blade in gage, convex side down.

c. Allow spring loaded flush pin to contact measuring recess at blade tip.

d. Slide PWA 17019 holder toward flush pin until indicator point rests on center of flush pin.

e. Add plus dial reading, or subtract minus dial reading from dimension stamped on base of gage.

NOTE

Resultant dimension is actual length of blade.

f. Subtract dimension on blade trailing edge root face from dimension in step e. to obtain amount of blade stretch.

g. See figure 1 for maximum stretch limit.

h. Remove blade from gage.

WORK PACKAGE

TECHNICAL PROCEDURES

DISK - TURBINE, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	16	5 - 6	2	10	16
2 - 3	0	7	0	11 - 13 Added	16
4	16	8 - 9	2	14 Blank Added	16

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the 2nd stage turbine disk.

2. SECOND STAGE TURBINE DISK - INSPECTION.

(See Figures 1 through 3.)

a. Ensure that second stage turbine disk has been cleaned per WP 201 00.

b. See figure 1 for visual and dimensional inspection areas and limits.

c. Fluoresent penetrant inspect second stage turbine disk for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed. All crack indications observed are cause for rejection and require Material Review Board (MRB) evaluation. See figure 2.

d. Eddy current inspect second stage turbine disk to requirements of figure 3. Refer to T.O. 2J-f100-9.

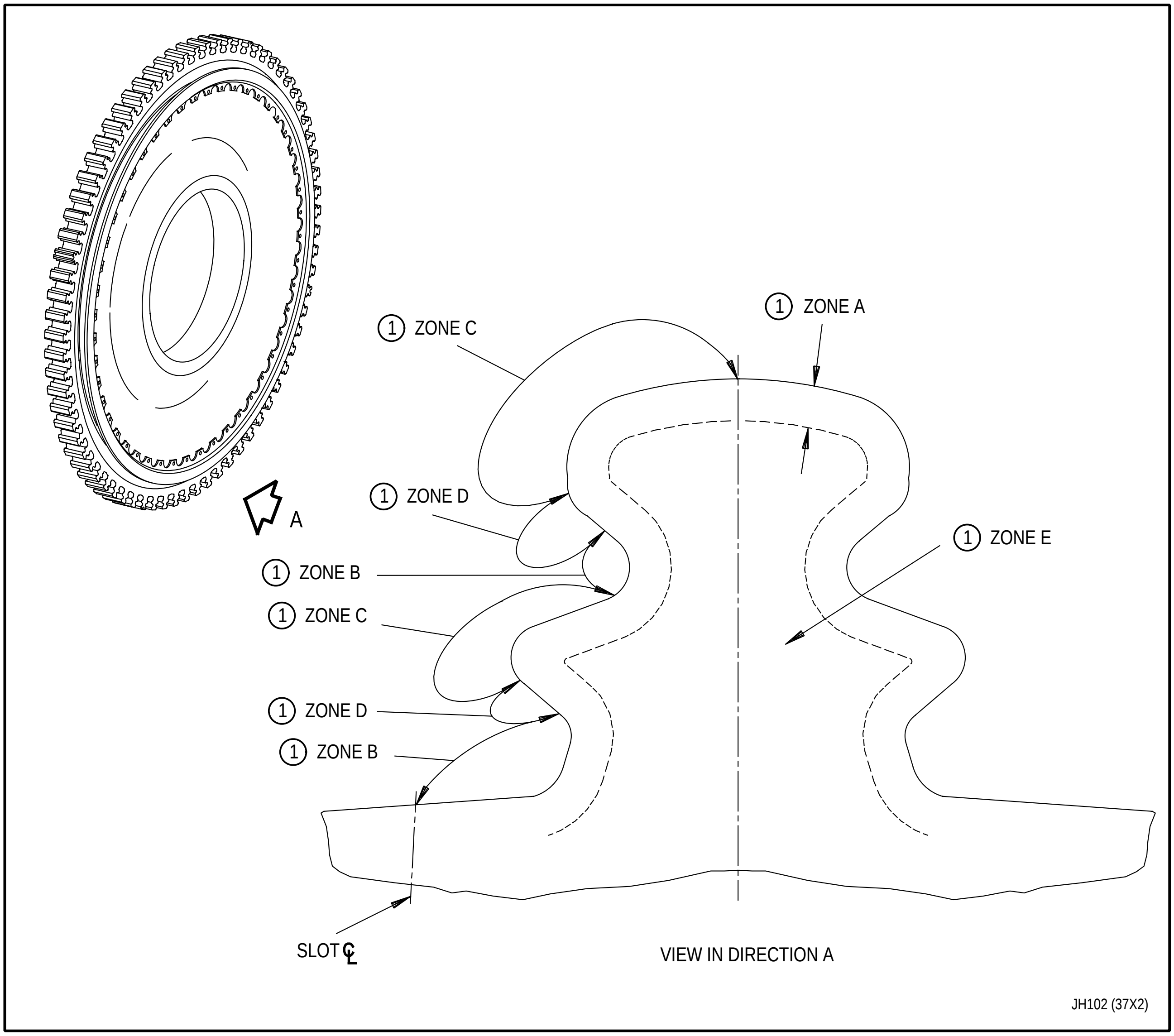


Figure 1. Second Stage Turbine Disk - Inspection (Sheet 1 of 3)

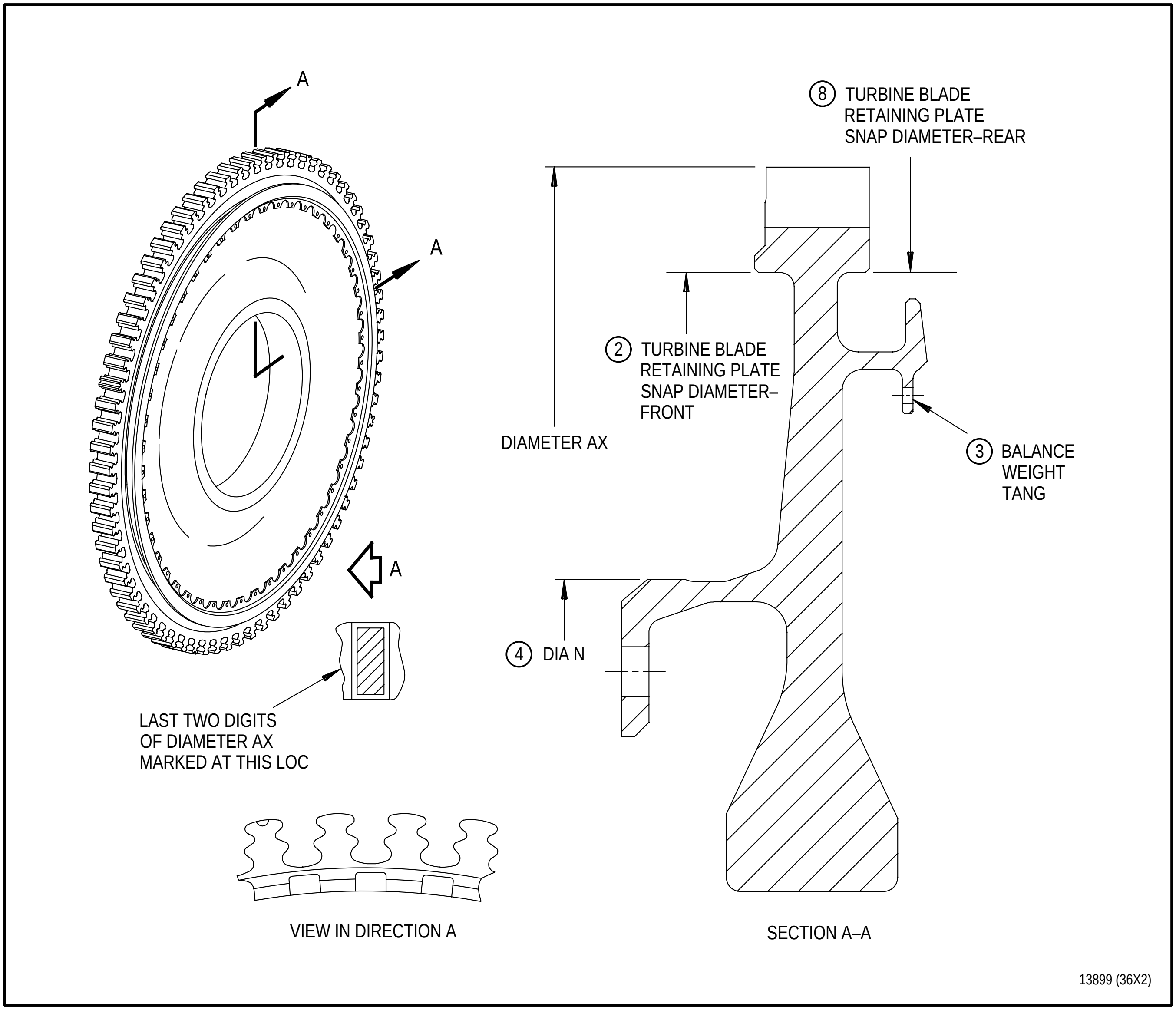


Figure 1. Second Stage Turbine Disk - Inspection (Sheet 2 of 3)

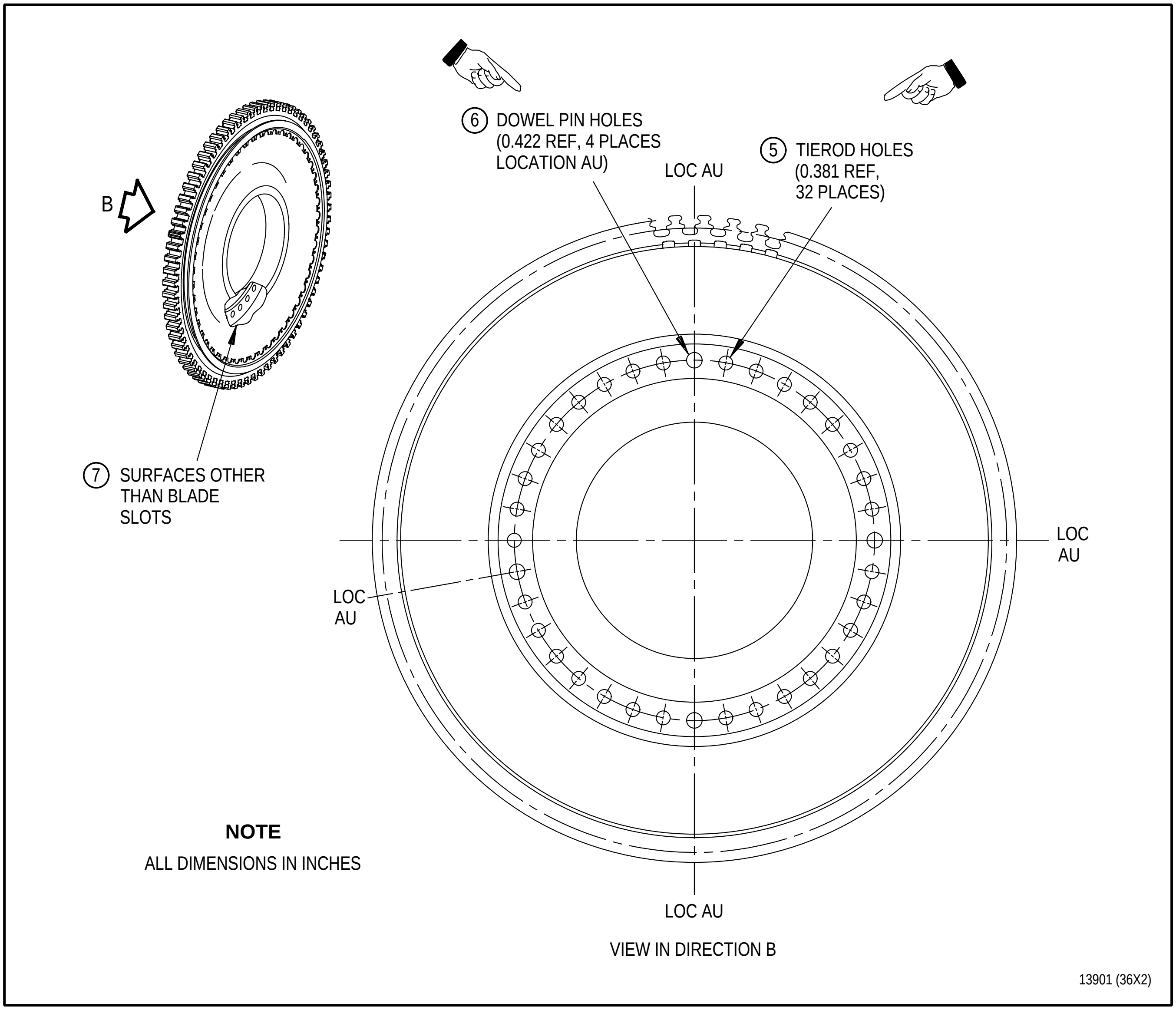


Figure 1. Second Stage Turbine Disk - Inspection (Sheet 3 of 3)

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action

NOTE

Limits for Diameters 2 and 4 apply when Surface R is constrained and disk conforms to Dimension AD within 0.0005 inch. Apply constraint only to Surface P , R , S , and T .

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Blade slot -			
Zone A - (Typical both sides)			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone B -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone C -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
Zone D -			
Pits, nicks, dents, scratches	Not serviceable	Not reparable	Replace disk.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Blade slot - (continued)			
Zone E -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
2. Turbine blade retaining plate snap Diameter -	15.965 inch maximum diameter	See corrective action	Replace disk.
3. Balance weight flange tang -			
Cracked, broken, or sheared	Not serviceable	See corrective action	Replace disk.
Bent	0.020 inch out of plane (as measured from tip)	See corrective action	Replace disk.
Burning or erosion	Not serviceable	Not reparable	Replace disk. Check for over temperature condition Ref.to T.O. 2J-F100-53-2
4. Diameter N -			
Wear	11.237 to 11.241 inch diameter	See corrective action	Replace disk.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Tierod holes 0.381 inch Ref.diameter, 32 places) -			
Suspected cracks via fluorescent penetrant inspection	Not serviceable	See corrective action	Replace disk.
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
6. Dowel pin holes 0.422 inch Ref.diameter, 4 places) -			
Suspected cracks via fluorescent penetrant inspection	Not serviceable	See corrective action	Replace disk.
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
7. Surfaces other than blade slot -			
Pits, nicks, dents, scratches	Not serviceable	See corrective action	Replace disk.
8. Turbine blade retaining plate snap diameter, rear	15.962 inch maximum diameter	Not reparable	Replace disk.

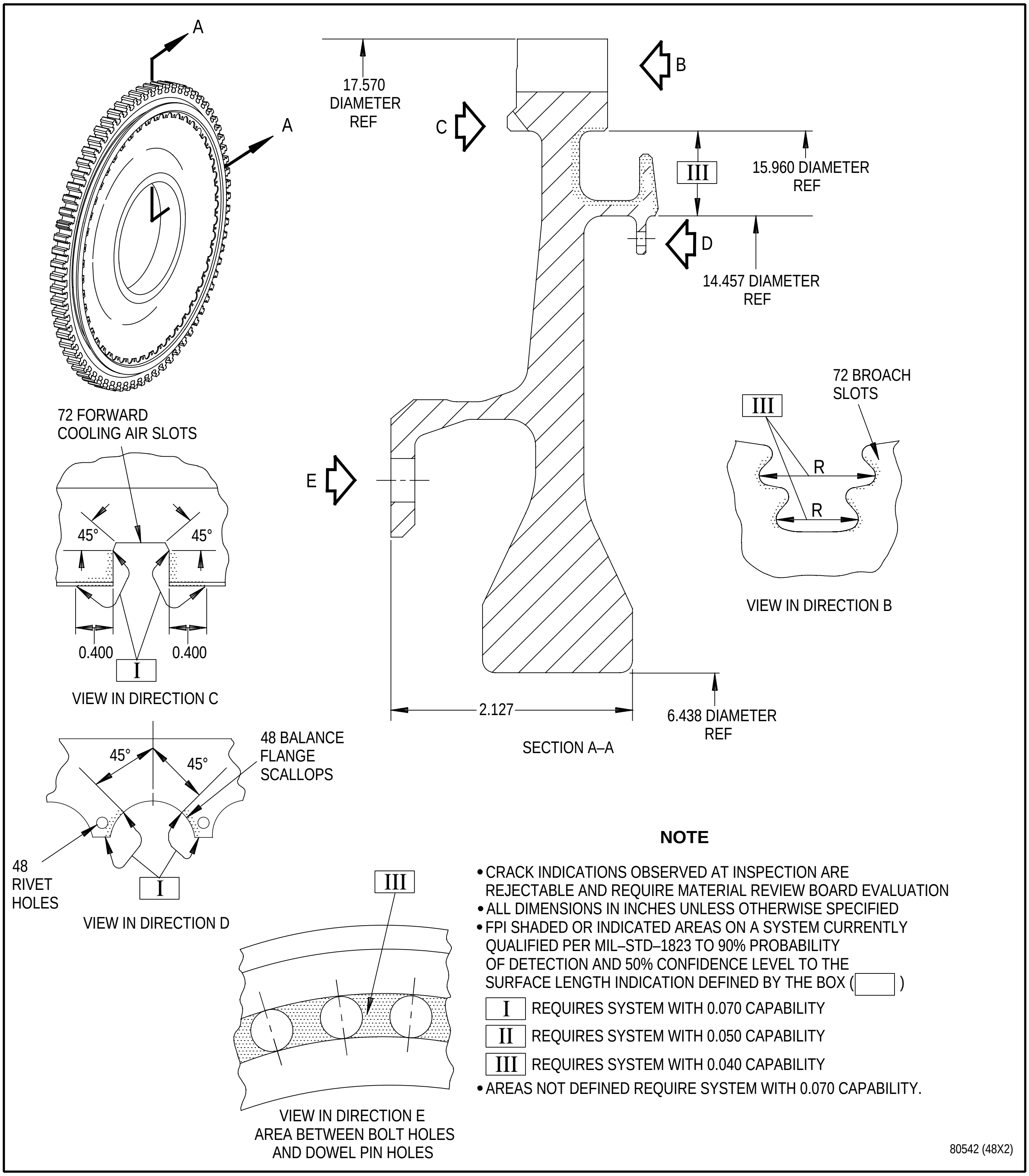


Figure 2. Second Stage Turbine Disk - Required Fluorescent Penetrant System Capability

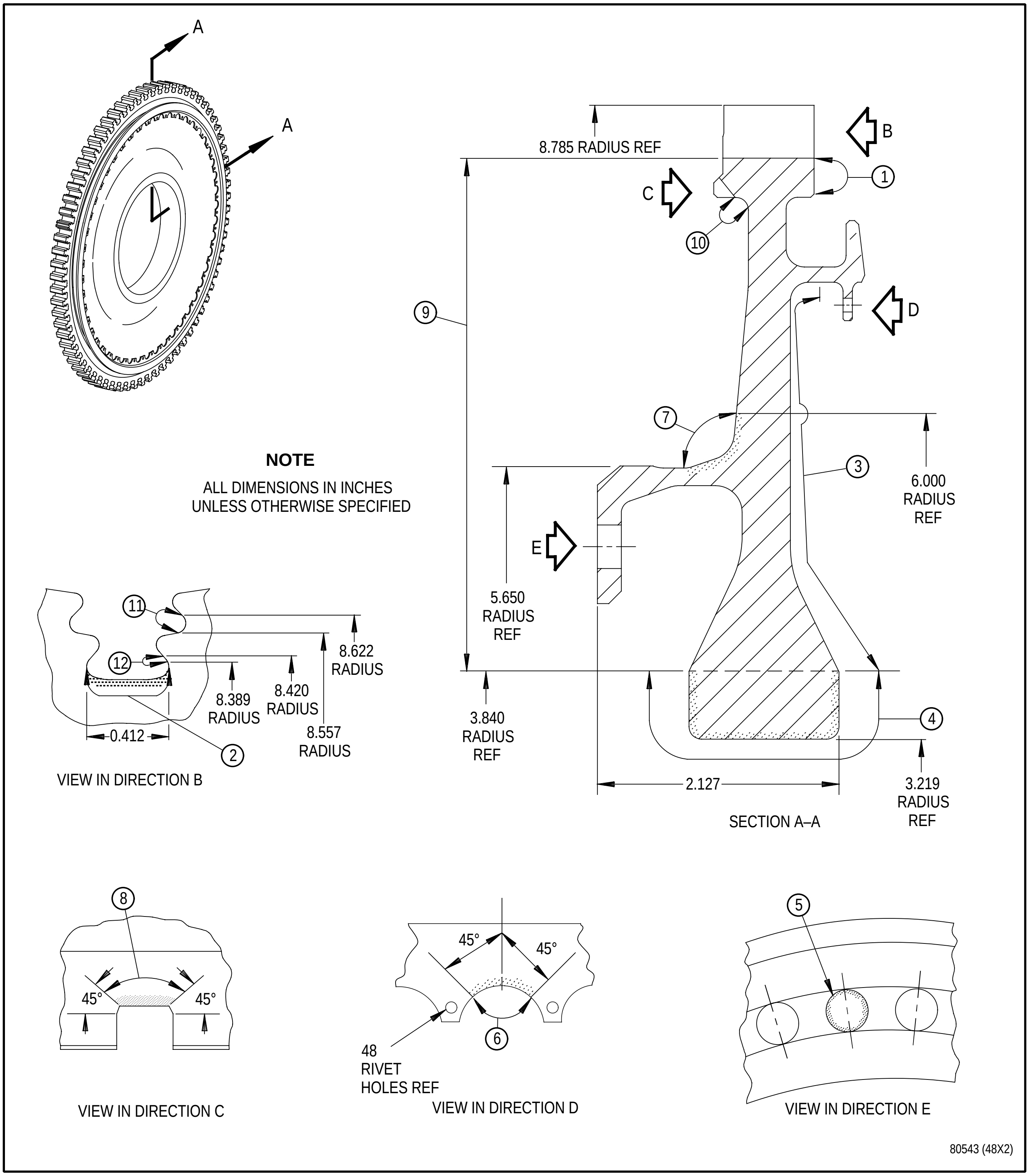


Figure 3. Second Stage Turbine Disk - Eddy Current Inspection

Legend for figure 3

	Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	SRL System Rejection Limits (Counts)	(A50-inch)	Corrective Action
1.	Disk rim	0.010	Radial	TBD	TBD	Replace disk.
2.	Broach slots bottom, 72 places	0.005	Axial	TBD	TBD	Replace disk.
3.	Disk web	0.010	Circumferential, Radial	TBD	TBD	Replace disk.
4.	Disk bore	0.008	Axial, Radial	TBD	TBD	Replace disk.
5.	Bolt holes, 32 places. Dowel pin holes, 4 places	0.010	Axial	TBD	TBD	Replace disk.
6.	Balance flange scallops, 48 places	0.005	Axial	TBD	TBD	Replace disk.
7.	Web radius	0.005	Circumferential, Axial, Radial	TBD	TBD	Replace disk.
8.	Forward cooling air slots, 72 places	0.005	Radial	TBD	TBD	Replace disk.
9.	Disk web	0.010	Circumferential, Radial	TBD	TBD	Replace disk.
10.	Disk rim inner radius	0.010	Circumferential, Radial	TBD	TBD	Replace disk.
11.	Disk broach outer tooth	0.020	Axial	TBD	TBD	Replace disk.
12.	Disk broach inner tooth	0.020	Axial	TBD	TBD	Replace disk.

*Eddy current inspect on system currently qualified per MIL-STD-1823 at 90% probability of detection and 50% confidence level for required flaw depth.

3. SECOND STAGE TURBINE DISK ASSEMBLY - STRETCH MEASUREMENT.
(See figure 1, sheet 2.)

a. Perform stretch measurement as follows:

(1) Obtain average diameter starting at Location AU and measuring dimension across Diameter AX, at center of disk lug, at four equally spaced places

(2) If average diameter exceeds dimension marked on disk by more then 0.004 inch, hold for future disposition.

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE - RETAINING, BLADE, TURBINE, REAR, SECOND STAGE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

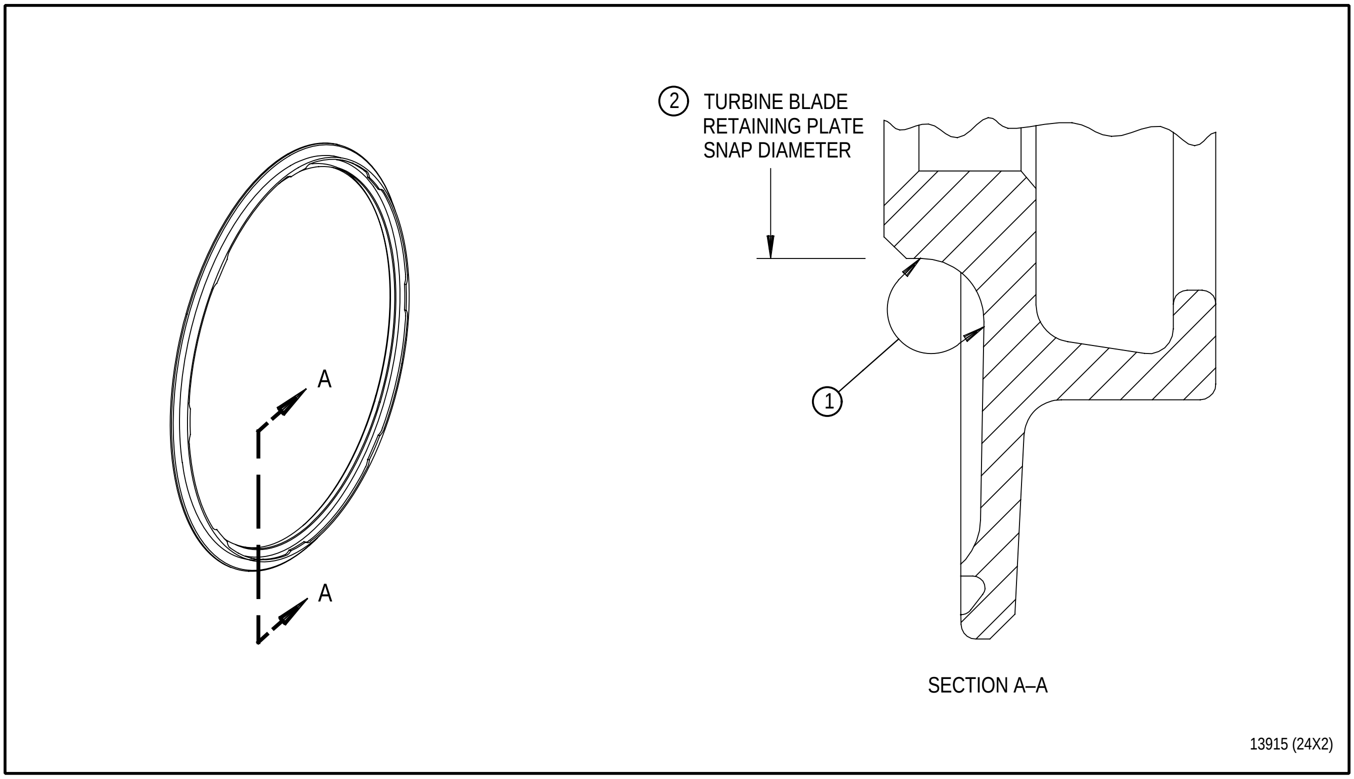
a. This work package contains instructions for inspection of the 2nd stage turbine blade rear retaining plate.

2. SECOND STAGE TURBINE BLADE REAR RETAINING PLATE - INSPECTION.
(See Figures 1 and 2.)

a. Ensure that second stage turbine blade rear retaining plate has been cleaned per WP 201 00.

b. See figure 1 for specific inspection areas and limits.

c. Fluorescent penetrant inspect second stage turbine blade rear retaining plate for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed. All crack indications observed are cause for rejection and require Material Review Board (MRB) evaluation. See figure 2.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Hook pad area -			
Cracks	Not serviceable	Not reparable	Replace retaining plate.
2. Turbine blade retaining plate snap diameter	15.967 inch minimum diameter	Not reparable	Replace retaining plate.
All other areas -			
Cracks	Not serviceable	See corrective action	Replace retaining plate.
Nicks, dents, scratches	Not serviceable	See corrective action	Replace retaining plate.

Figure 1. Second Stage Turbine Blade Rear Retaining Plate - Inspection

NOTE

- CRACK INDICATIONS OBSERVED AT INSPECTION ARE REJECTABLE AND REQUIRE MATERIAL REVIEW BOARD EVALUATION
- ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
- FPI SHADED OR INDICATED AREAS ON A SYSTEM CURRENTLY QUALIFIED PER MIL–STD–1823 TO 90% PROBABILITY OF DETECTION AND 50% CONFIDENCE LEVEL TO THE SURFACE LENGTH INDICATION DEFINED BY THE BOX ( )

  I REQUIRES SYSTEM WITH 0.070 CAPABILITY

  II REQUIRES SYSTEM WITH 0.050 CAPABILITY

  III REQUIRES SYSTEM WITH 0.040 CAPABILITY
- AREAS NOT DEFINED REQUIRE SYSTEM WITH 0.070 CAPABILITY.

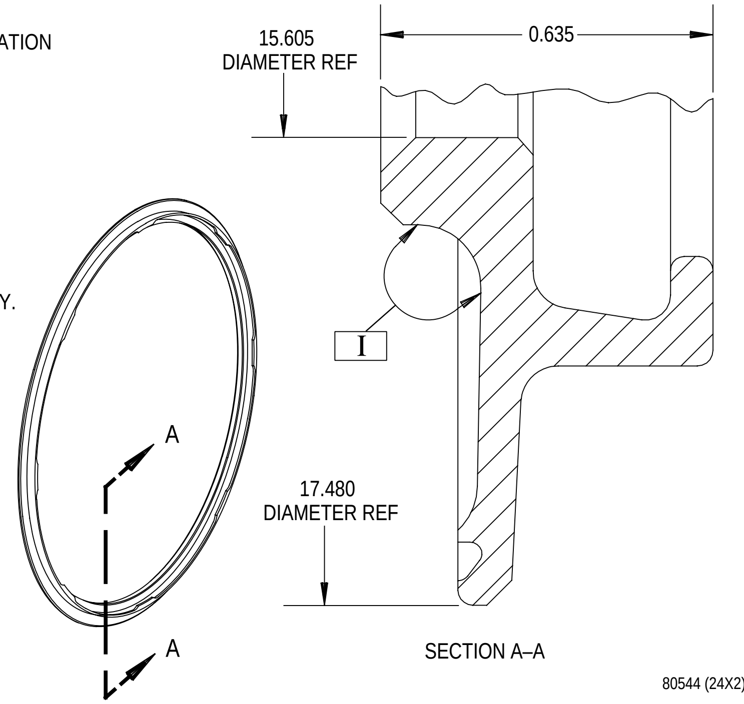


Figure 2. Second Stage Turbine Blade Rear Retaining Plate - Required Fluorescent Penetrant System Capability

WORK PACKAGE

TECHNICAL PROCEDURES

TIEROD, TURBINE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	0				

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the turbine tierods.

2. TURBINE TIERODS (FIRST TO SECOND STAGE TURBINE DISKS) - INSPECTION WITH TIERODS REMOVED FROM DISK.
(See Figure 1.)

NOTE

Tierods to be inspected shall be free of oil and dirt.

a. Visually inspect tierods for cracks and damaged threads.

b. Visually inspect tierods for burrs or raised material on tierod lands. Polish off burrs or raised material to original surface using crocus cloth.

c. Fluorescent penetrant inspect. Refer to T.O. 2J-F100-9. Reject cracked tierods.

NOTE

Turbine tierods stretch measurement is required each time turbine tierods are removed from the 1st disk.

d. Inspect tierods as follows:

NOTE

It is permissible to use a one to two inch micrometer to measure tierods.

e. Measure Dimension L in figure 1. Reject tierods having stretch in excess of 0.006 inch over 1.591 inches maximum.

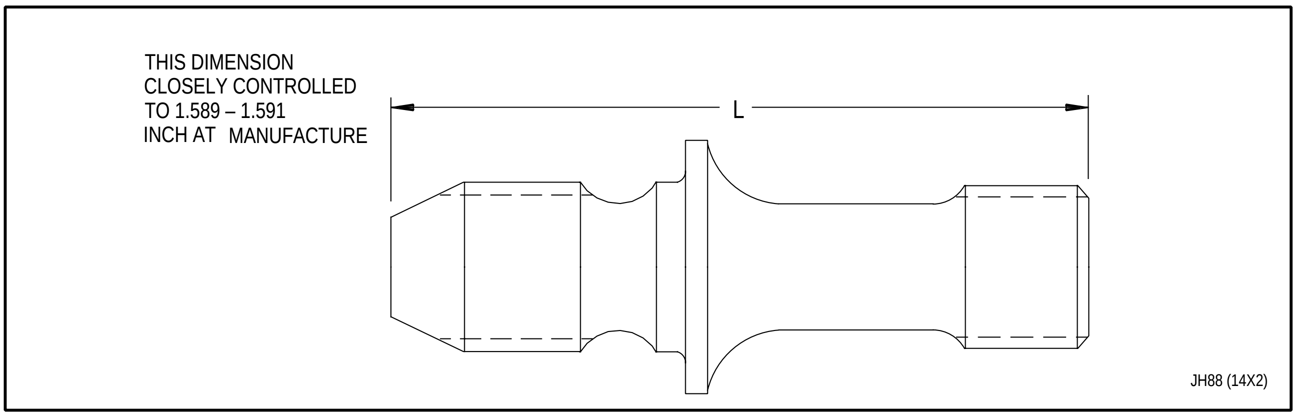


Figure 1. Turbine Tierods - Stretch Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

HUB ASSEMBLY - TURBINE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	27	7 - 8	23	9	23
4	23	8A Added	23	10 Added	16
5	4	8B Blank Added	23	11	27
6	27			12 Blank Added	16

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine - Table of Limits and Clearance Charts	WP 801 00
Nondestructive Evaluation System Reliability Accessment	MIL-HDBK-1823

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for inspection of the turbine hub assembly.

2. TURBINE HUB ASSEMBLY - INSPECTION.

(See Figures 1 through 3.)

a. Ensure that turbine hub assembly has been cleaned per WP 201 00.

b. See figure 1 for visual and dimensional inspection areas and limits. Refer to T.O. 2J-F100-9.

c. Fluorescent penetrant inspect turbine hub assembly for cracks on a system with capability defined in figure 2. Refer to T.O. 2J-F100-9. No cracks allowed.

d. Eddy current inspect turbine hub to requirements of figure 3.

e. Apply antigallant per WP 414 00.

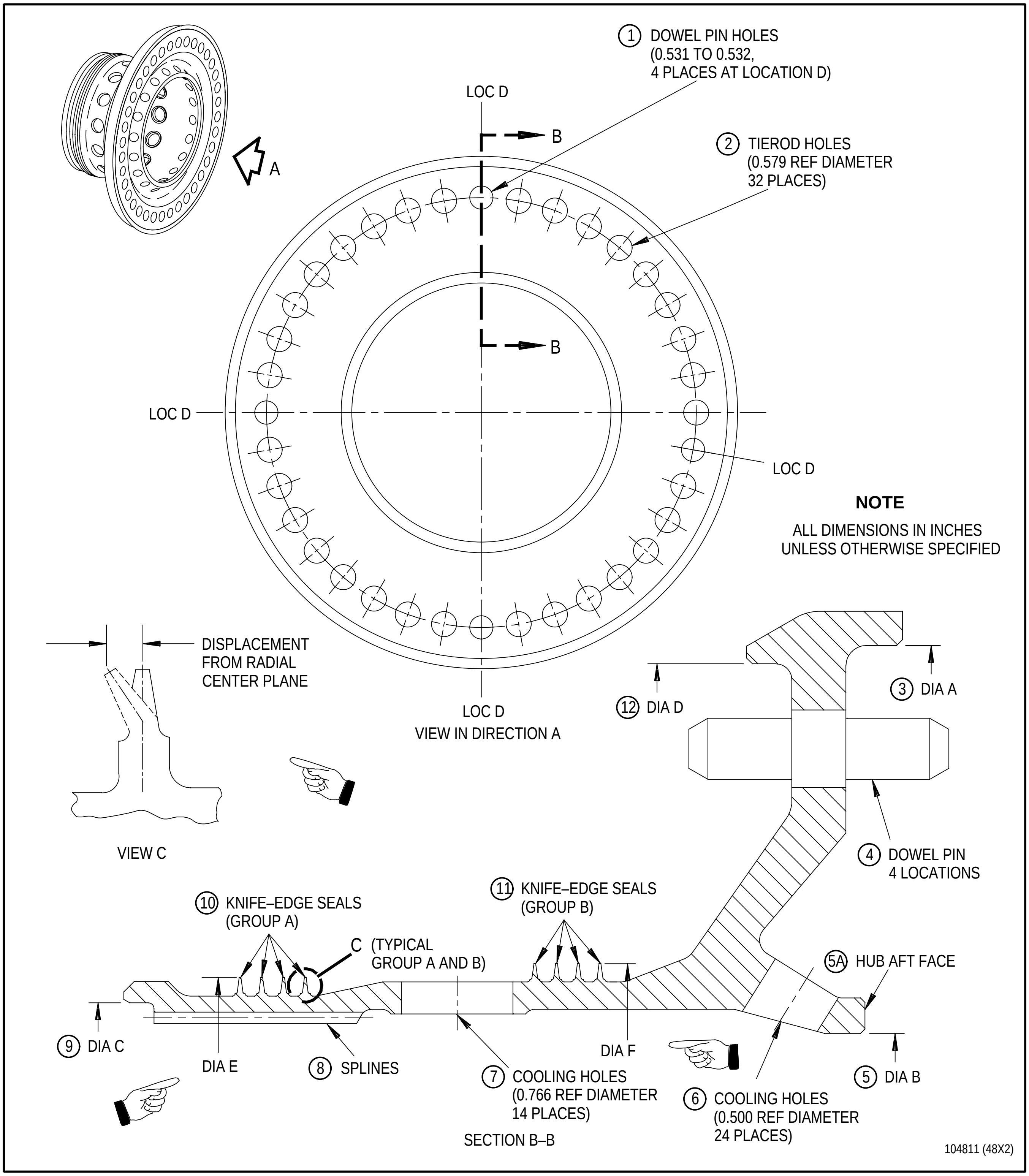


Figure 1. Turbine Hub Assembly - Inspection

Legend for figure 1

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
1. Dowel Pin Holes 0.5315 Ref. diameter-			
Suspected cracks via FPI	Not serviceable	Not reparable	Replace hub assembly.
Pits, nicks, dents, scratches	Not serviceable	Not reparable	Replace hub assembly.
Wear	Not serviceable	0.531 to 0.542 inch diameter	Repair per WP 414 00.
2. Tierod Holes 0.579 inch Ref. diameter-			
Suspected cracks via FPI	Not serviceable	Not reparable	Replace hub assembly.
Pits, nicks, dents, scratches	Not serviceable	Not reparable	Replace hub assembly.
3. Diameter A (Hub to 2nd disk) -			
Wear	11.233 to 11.237 inch diameter	Not reparable	Replace hub assembly.
4. Dowel Pins -			
Damaged, loose	Not serviceable	Any amount	Replace Dowel Pin per WP 414 00.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
5. Diameter B Hub to rear compressor shaft -			
Wear	5.917 to 5.919 inch diameter	Not reparable	Replace hub assembly.
5A. Hub, AFT Face			
Pits, nicks and foreign material deposits.	Not serviceable	Up to 0.005 inch depth	Blend Repair with stone. Refer to T.O. 2J-F100-53-1, WP 091 00.
6. Cooling Holes 0.500 inch Ref. diameter-			
Suspected cracks via FPI	Not serviceable	Not reparable	Replace hub assembly.
Pits, nicks, dents	Not serviceable	Not reparable	Replace hub assembly.
7. Cooling Holes 0.766 inch Ref. diameter-			
Cracks	Not serviceable	Not reparable	Replace hub assembly.
Pits, nicks, and dents	Not serviceable	See corrective action.	Blend round bottom damage on hole edge radius or hole ID per WP 414 00.
8. Splines -			
Pits, nicks, and dents	Not serviceable	Not reparable	Replace hub assembly.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
9. Diameter C (Hub to rear compressor shaft) -			
Wear	6.336 to 6.339 inch diameter	Not reparable	Replace hub assembly.
10. Knife-edge seals (Group A) -			
Wear	Average minimum serviceable diameter: Diameter E 6.680 inches	Not reparable	Replace hub assembly.
Bent	0.500 inch in length per knife-edge seal. 0.050 displacement from radial center plane	Damage is reparable if the final blend meets the blend limits in WP 414 00.	Blend repair per WP 414 00.
Nicks and dents	Not serviceable	Damage is reparable if the final blend meets the blend limits in WP 414 00.	Blend repair per WP 414 00.
Cracks	Not serviceable	Not reparable	Replace hub assembly.

Legend for figure 1 (continued)

Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
11. Knife-edge seals (Group B) -			
Wear	Average minimum serviceable diameter: Diameter F 6.883 inches	Average minimum reparable diameter: Dia F 6.875 inches	Strip and recoat per WP 414 00.
Nicks and dents	Not serviceable	Damage is reparable if the final blend meets the blend limits in WP 414 00.	Blend repair per WP 414 00.
Cracks	Not serviceable	Not reparable	Replace hub assembly
Bent	0.500 inch in length per knife-edge seal. 0.050 inch maximum displacement from radial center plane	Damage is reparable if the final blend meets the blend limits in WP 414 00.	Blend repair per WP 414 00.
Chipped or missing coating	Visible as lost top coating missing from bond coat layer by defined lines of demarcation. See figure 1A. Coating may be chipped or missing in up to six 0.250 inch long areas, but shall be separated by at least one inch per knife-edge.	Any amount	Strip and recoat per WP 414 00.
12. Diameter D (Hub to 1st disk) -			
Wear	10.981 to 10.985 inch diameter	Not reparable	Replace hub assembly.

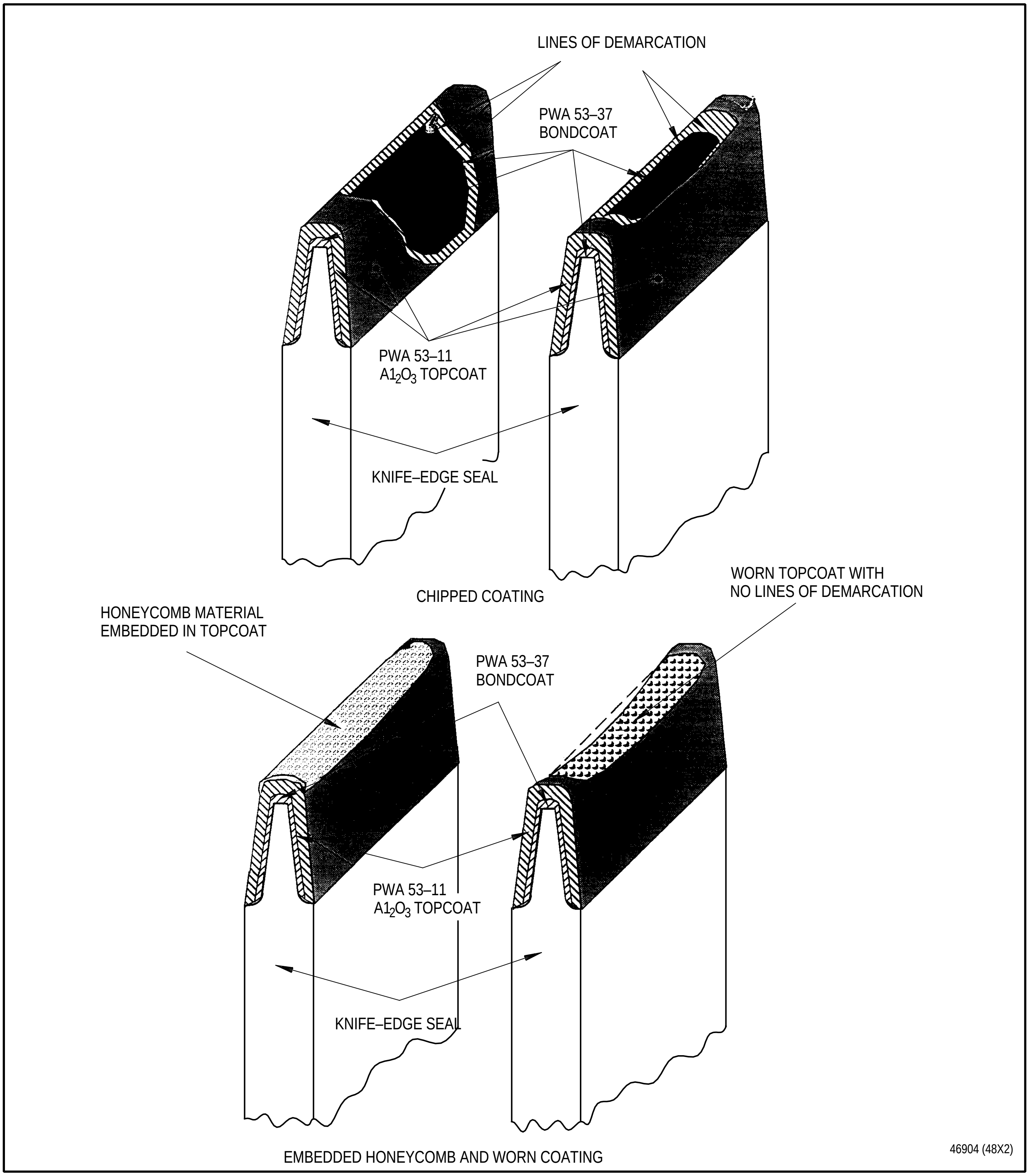
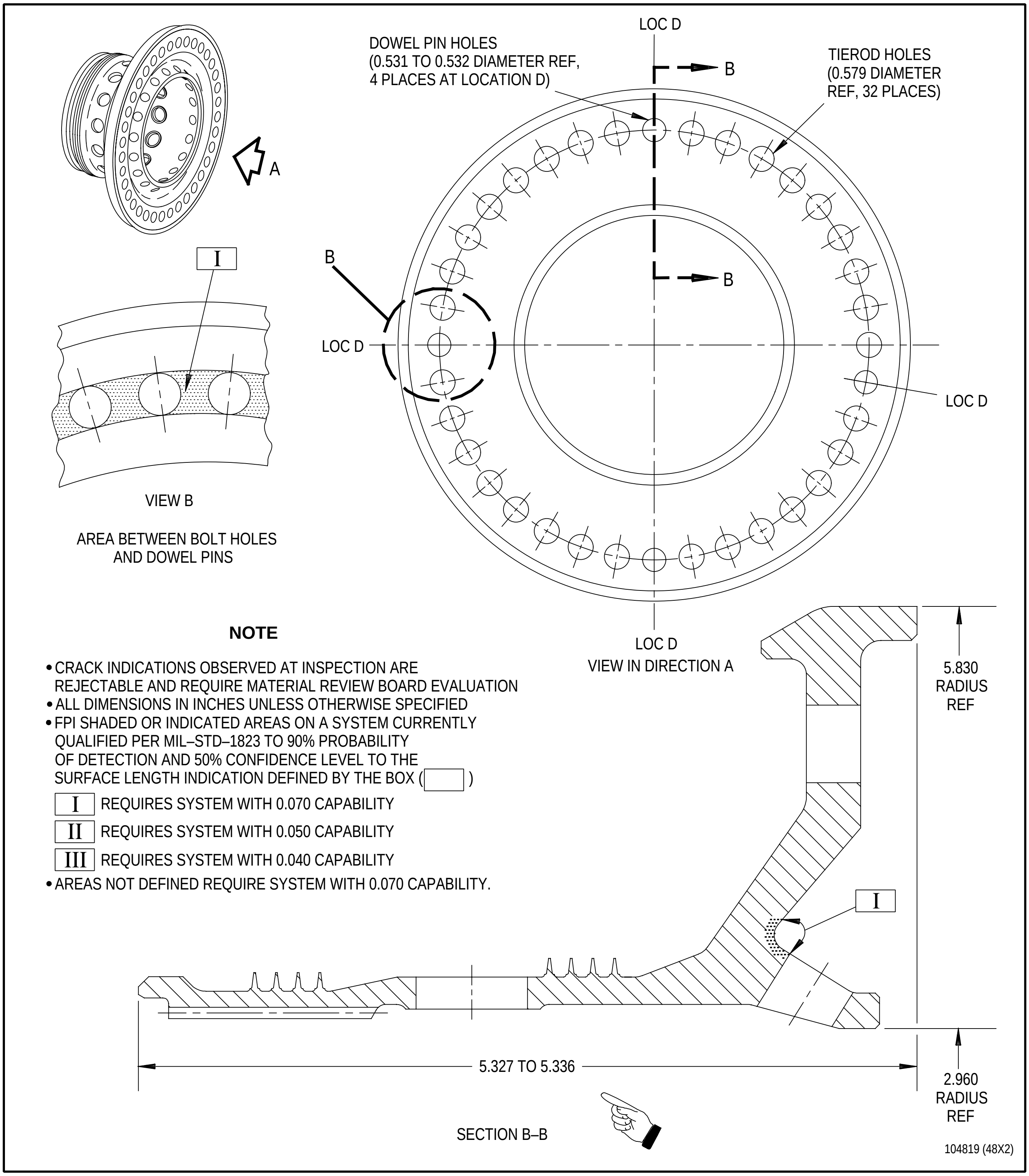


Figure 1A. Turbine Hub Assembly - Chipped Coating, Embedded Honeycomb, and Worn Coating



NOTE

- CRACK INDICATIONS OBSERVED AT INSPECTION ARE REJECTABLE AND REQUIRE MATERIAL REVIEW BOARD EVALUATION
- ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED
- FPI SHADED OR INDICATED AREAS ON A SYSTEM CURRENTLY QUALIFIED PER MIL–STD–1823 TO 90% PROBABILITY OF DETECTION AND 50% CONFIDENCE LEVEL TO THE SURFACE LENGTH INDICATION DEFINED BY THE BOX ( )

I REQUIRES SYSTEM WITH 0.070 CAPABILITY
II REQUIRES SYSTEM WITH 0.050 CAPABILITY
III REQUIRES SYSTEM WITH 0.040 CAPABILITY

- AREAS NOT DEFINED REQUIRE SYSTEM WITH 0.070 CAPABILITY.

Figure 2. Turbine Hub - Required Fluorescent Penetrant System Capability

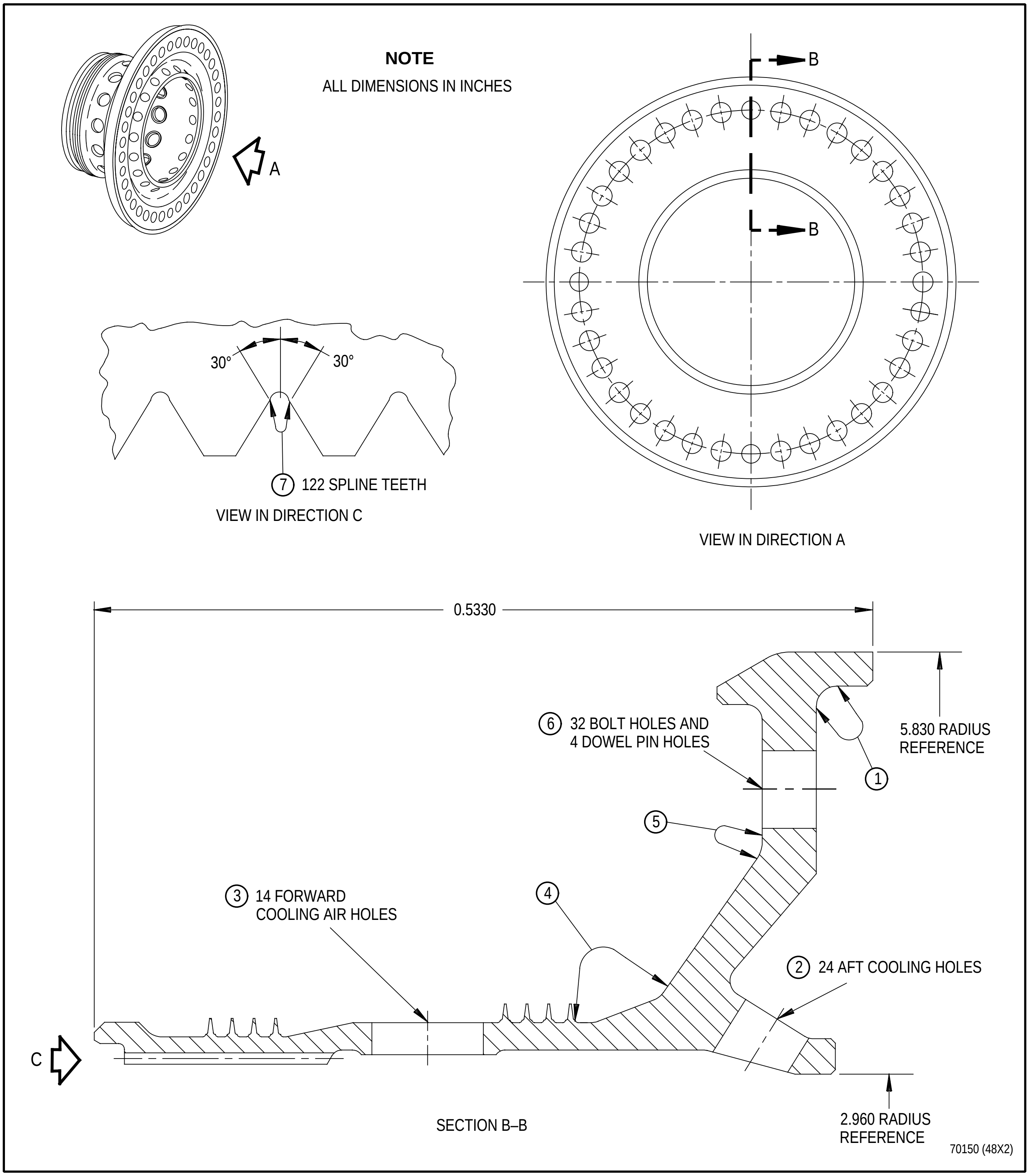


Figure 3. Turbine Hub - Eddy Current Inspection

Legend for figure 3

Inspection Area	*Maximum Flaw Depth (Inch)	Flaw Surface Orientation	ECIS System Rejection Limits Threshold (Counts)	a50 (Inch)	Corrective Action
1. Hub to 2nd disk - aft radius	0.020	Circumferential	3009	0.0143	Replace turbine hub.
2. Aft cooling holes (0.500 ref dia., 24 places)	0.010	Axial & Radial	101	0.0076	Replace turbine hub.
3. Forward cooling holes (0.766 ref dia., 14 places)	0.010	Axial & Radial	104	0.0075	Replace turbine hub.
4. Outside radial surface					
a. Forward face cone	0.010	circumferential	1339	0.0089	Replace turbine hub.
b. Forward knife-edge radius	0.020	Circumferential	3009	0.0143	Replace turbibe hub.
5. Forward radius near bolthole	0.007	Circumferential	168	0.0047	Replace turbine hub.
6. Tierod holes (0.579 ref dia., 32 places) Dowel pin holes (0.531 ref dia., 4 places)	0.005	Axial & Radial	48	0.0038	Replace turbine hub.
7. Spline teeth, 122 places					
a. Midthickness	0.010	Axial & Radial	394	0.0099	Replace turbine hub.
b. Edge surface	0.010	Axial & Radial	670	0.0089	Replace turbine hub.

*Eddy current inspect on system in compliance with MIL-HDBK-1823.

WORK PACKAGE

TECHNICAL PROCEDURES

RING - TURBINE BLADE RETAINING PLATE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

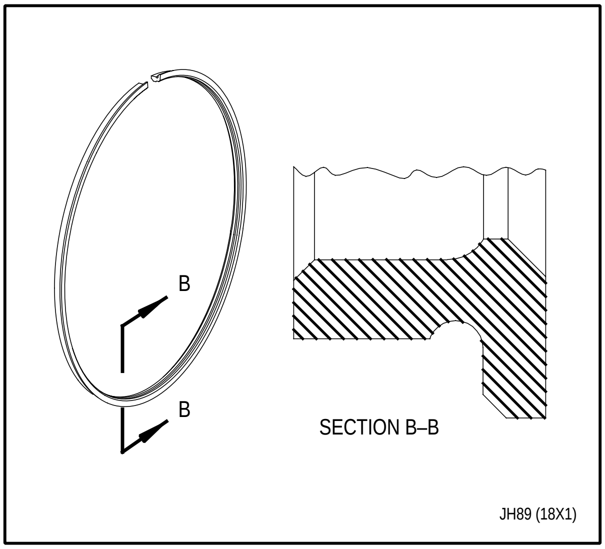
a. This work package contains instructions for inspection of the turbine blade retaining plate ring.

2. TURBINE BLADE RETAINING PLATE RING - INSPECTION.
(See Figure 1.)

a. Ensure that turbine blade retaining plate ring has been cleaned per WP 201 00.

b. Fluorescent penetrant inspect turbine blade retaining plate ring for cracks. Refer to T.O. 2J-F100-9. No cracks allowed.

c. See figure 1 for specific inspection areas and limits.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
All over -			
Cracks	Not serviceable	Not reparable	Replace ring.
Out-of-flat	0.050 inch	Not reparable	Replace ring.
Nicks, dents and scratches	Up to 0.010 inch deep	Not reparable	Replace ring.

Figure 1. Turbine Blade Retaining Plate Ring - Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

SPACER - TURBINE AIR SEAL -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	16	2 - 3	0	4	16

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

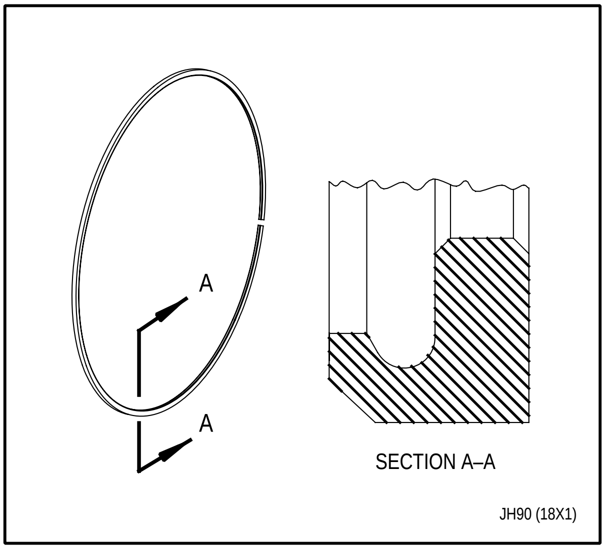
a. This work package contains instructions for inspection of the turbine air seal spacer.

2. TURBINE AIR SEAL SPACER - INSPECTION. (See Figure 1.)

a. Ensure that turbine air seal spacer has been cleaned per WP 201 00.

b. Fluorescent penetrant inspect turbine air seal spacer for cracks. Refer to T.O. 2J-F100-9. No cracks allowed.

c. See figure 1 for specific inspection areas and limits.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
All over -			
Cracks	Not serviceable	Not reparable	Replace spacer.
Out-of-flat	0.050 inch	Not reparable	Replace spacer.
Nicks, dents and scratches	Up to 0.010 inch depth	Not reparable	Replace spacer.

Figure 1. Turbine Air Seal Spacer - Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

DAMPER - TURBINE BLADE RETAINING PLATE -

INSPECTION

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	16	2 - 3	0	4	16

REFERENCE MATERIAL REQUIRED

Title		Number
Nondestructive Inspection	- -	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

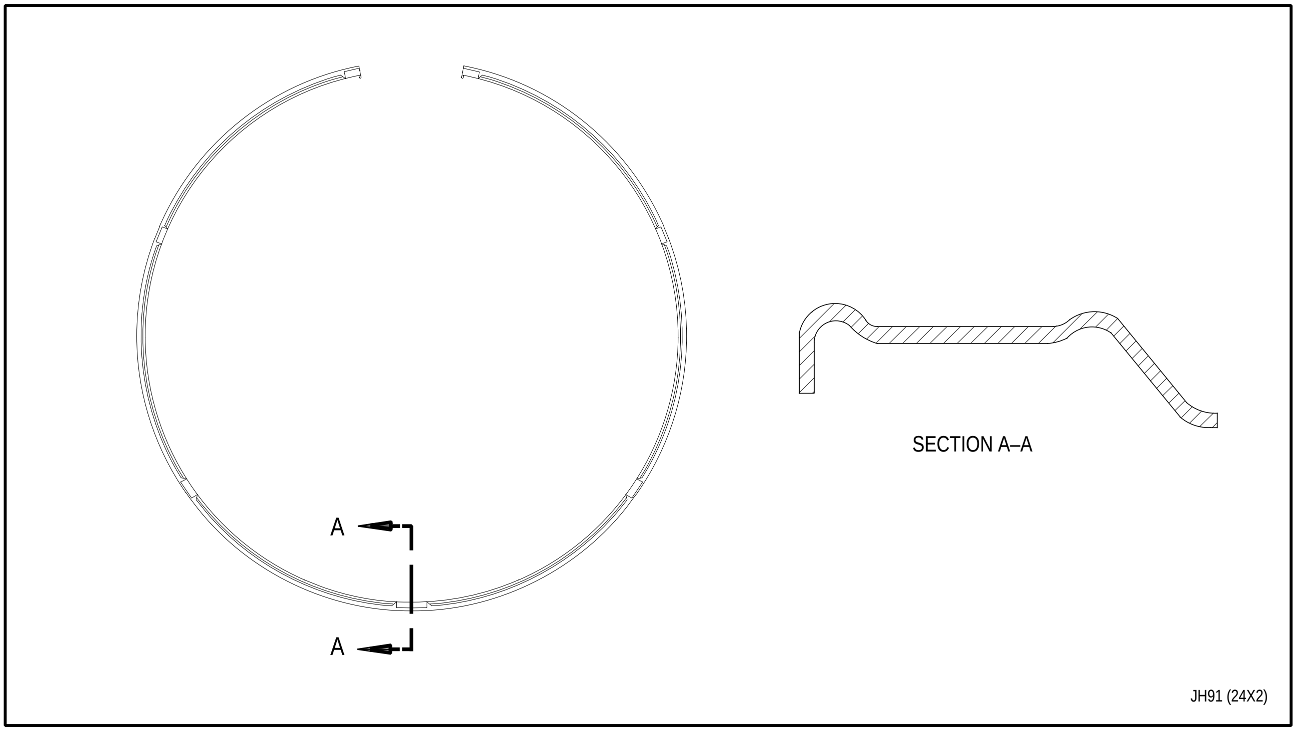
a. This work package contains instructions for inspection of the turbine blade retaining plate damper.

2. TURBINE BLADE RETAINING PLATE DAMPER - INSPECTION.
(See Figure 1.)

a. Ensure that turbine blade retaining plate damper has been cleaned per WP 201 00.

b. Fluorescent penetrant inspect turbine blade retaining plate damper for cracks. Refer to T.O. 2J-F100-9. No cracks allowed.

c. See figure 1 for specific inspection areas and limits.



Inspection Area - Condition	Maximum Serviceable Limits	Maximum Reparable Limits	Corrective Action
All over -			
Cracks	Not serviceable	Not reparable	Replace damper.
Out-of-flat	0.050 inch	Not reparable	Replace damper.
Nicks, dents and scratches	Not serviceable	See corrective action	Blend repair per WP 417 00.

Figure 1. Turbine Blade Retaining Plate Damper - Inspection

WORK PACKAGE

TECHNICAL PROCEDURES

BLADES, TURBINE ROTOR, FIRST AND SECOND STAGE -

MOMENT-WEIGHT CLASSIFICATION

EFFECTIVITY: ENGINE MODEL F100-PW-229

This Work Package Supersedes WP 318 00 Through and Including Change 0

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 5	15	6 Blank	15		

REFERENCE MATERIAL REQUIRED

Title	Number
Rear Compressor Drive Turbine - - - - - - - - - - - - - - - - - - -	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine - Final Assembly - - - - - -	WP 701 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
DYE, LAYOUT OR INK, METAL MARKING	MICRO-SUPREME (PURPLE) NO. 977-9 (BLACK) NO. 977-9 (WHITE)
PENCIL, SILVER MARKING	COLORBRITE NO. 2101 OR ANADELL NO. 1936 OR COLOR-TEX NO. 1843

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	FIRST AND SECOND STAGE TURBINE ROTOR BLADES - MOMENT-WEIGHT CLASSIFICATION	
	TESTER, MOMENT-WEIGHT BLADES ---------------	PWA 55456
	ADAPTER, 1ST STAGE TURBINE BLADE MOMENT-WEIGHT --	PWA 55445
	ADAPTER, 2ND STAGE TURBINE BLADE MOMENT-WEIGHT --	PWA 55446

ILLUSTRATED SUPPORT EQUIPMENT

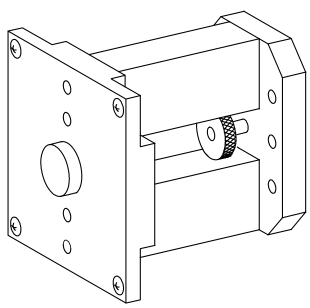


Figure T1. PWA 55445 ADAPTER

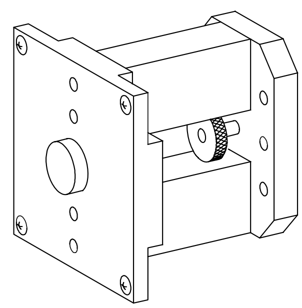


Figure T2. PWA 55446 ADAPTER

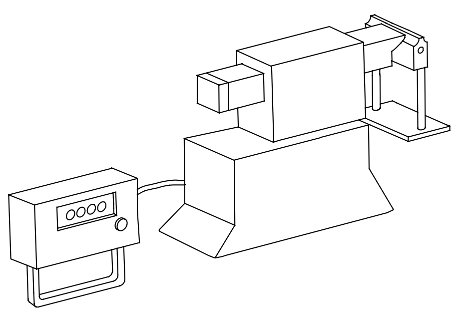


Figure T3. PWA 55456 TESTER

1. INTRODUCTION.

a. This work package contains instructions for master preparation and moment-weight classification of the 1st and 2nd stage turbine rotor blades.

2. FIRST AND SECOND STAGE TURBINE ROTOR BLADES - MOMENT-WEIGHT CLASSIFICATION.

(See Figure 1, and Table 1.)

NOTE

Periodic checks shall be made with calibrated blade to ensure scale accuracy.

a. Check table 1 for proper adapter and its matching counterweight for stage of blade to be moment-weighed.

b. Verify that PWA 55456 tester has been previously calibrated per procedure outlined in manufacturer’s manual.

c. Check the bull’s eye level(11, figure 1). Adjust leveling feet(9) as required to level tester.

d. Install proper blade adapter(2).

e. Install proper calibrated blade into adapter by backing out locking screw(3), inserting blade, and tightening locking screw fingertight.

f. Mark location of locking screw knurled knob. Back out locking screw 1/4 to 1/2 turn and remove calibrated blade. Turn locking screw back into marked location.

g. Turn on digital readout(1) and allow 15 minutes for warmup to ensure accurate calibration.

h. Center the zero adjust control(10) on digital readout panel by turning control knob counterclockwise to the stop, then clockwise, counting total number of turns of knob to the stop. Now turn counterclockwise 1/2 the number of full and fractional turns.

i. Remove any counterweights from counterweight hanger pan(7).

j. Select coarse balance counterweight(6) and install on proper coarse balance rod. Adjust coarse balance weight until initial balance of 10.00 ounce-inches or less is obtained.

k. Adjust knurled weights inside main lever at rear of tester to obtain medium balance of 2.00 ounce-inches or less.

l. Adjust fine zero knob on the digital readout to read 0.00 ±0.01 ounce-inch or better.

m. Install calibrated blade. If blade is heavier than 100.00 ounce-inches, place 10.00 ounce counterweight on the counterweight hanger pan.

n. Reading on digital readout should equal weight reading marked on calibrated blade within ±0.02 ounce-inch. If not, recalibrate tester.

o. Install blades to be moment-weighted one at a time. Record moment-weight reading from digital readout.

p. Remove blade and mark reading on blade using nonetching ink, layout dye, or silver pencil.

NOTE

Paired moment-weighed blades consist of two blades having a moment-weight within 0.05 ounce-inches.

q. Pair moment-weighed blades as required per WP 701 00.

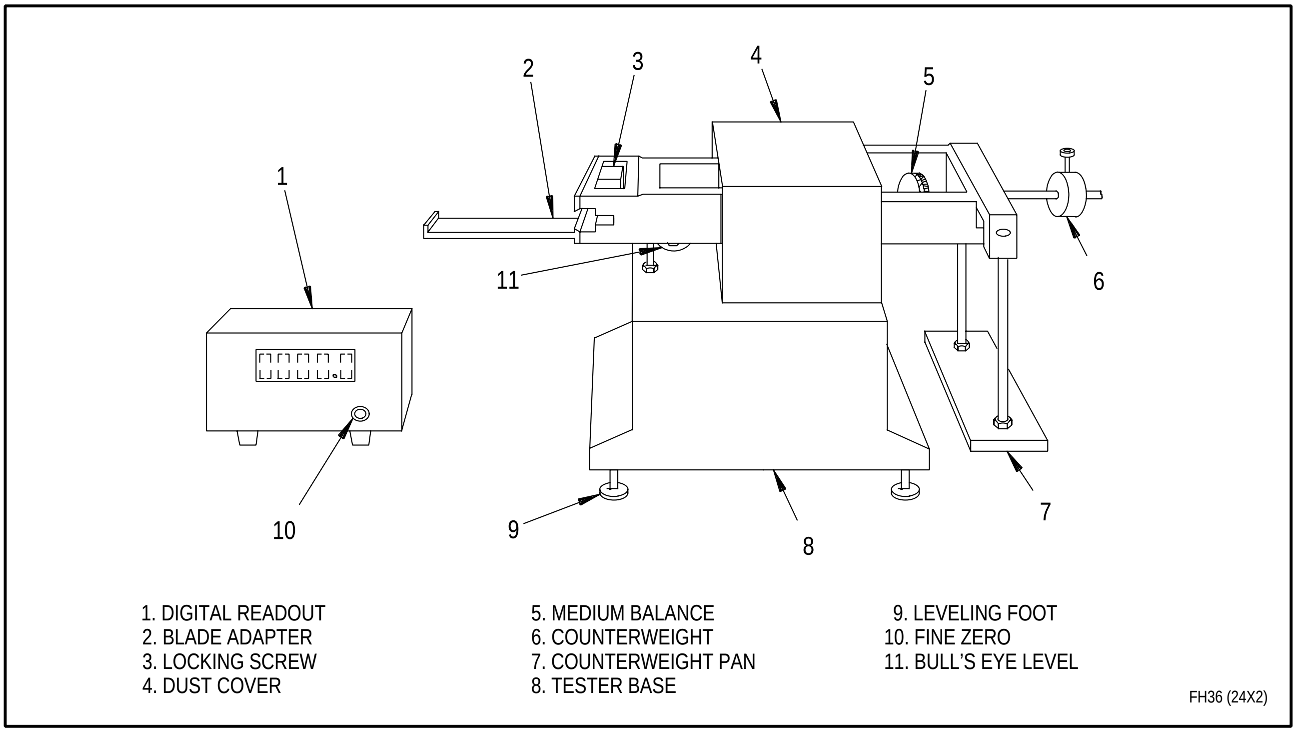


Figure 1. PWA 55456 Moment-weight Tester

Table 1. First And Second Stage Turbine Rotor Blades - Moment-weight Tools

Scale	Blade Stage	Adapter	Master Blade
PWA 55456 (0 to 10) range 8.900 inch fulcrum	1st turbine	PWA 55445	Reference PN 4063801 moment-weight 40.20 oz-in.
PWA 55456 (0 to 10) range 8.440 inch fulcrum	2nd turbine	PWA 55446	Reference PN 4059422 moment-weight 32.54 oz-in.

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23				

1. INTRODUCTION.

a. This work package introduces the 400 00 through 599 00 series of work packages for repair of rear compressor drive turbine. The following work packages are included in this series:

WP No.	Title
401 00	Seal - Air, Turbine, First Stage - Repair
402 00	Plate - Retaining, Blade, Turbine, First Stage (Front) - Repair
403 00	Open
404 00	Disk - Turbine, First Stage - Repair
405 00	Open
406 00	Duct and Support Set, Turbine, First Stage - Repair
407 00 through 408 00	Open
409 00	Plate, Retaining, Blade, Turbine, Second Stage - Repair
410 00 through 413 00	Open
414 00	Hub Assembly, Turbine Front - Repair
415 00 through 416 00	Open
417 00	Damper, Turbine Blade Retaining Plate - Repair
418 00 through 599 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

SEAL — AIR, TURBINE, FIRST STAGE

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 6	23				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Depot Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Grinding, Blending, Lapping, Buffing, and Peening	WP 091 00
Qualified Repair Source List (QRSL) Rear Compressor Drive Turbine	WP 604 00
Depot Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Seal - Air, Turbine, First Stage - Inspection	WP 301 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for repair of 1st stage turbine air seal (two or three knife-edge configuration).

2. FIRST STAGE TURBINE AIR SEAL - KNIFE-EDGE BLEND REPAIR. (See Figure 1.)

CAUTION

Attempting to straighten knife-edge air seals may damage part.

NOTE

Knife-edge blending repairs are to be completed after aluminum oxide coating is removed. Coating must be reapplied once blend repair is complete.

a. All damage shall be blended using fine files and stones. Refer to T.O. 2J-F100-53-1, WP 091 00. Remove all pickup and raised metal. Observe following blend limits:

(1) Blending shall be limited to one continuous inch on any one knife-edge or two total inches of noncontinuous blends per knife-edge.

(2) Blending shall be limited to three total inches of noncontinuous blends for all knife-edges.

(3) Noncontinuous blends shall be separated by minimum of one inch of unblended knife-edge. One inch separation required for blends adjacent to bend with displacement from radial center plane greater than 0.010 but less than 0.050 inches.

(4) Maximum blend depth shall be 0.075 inch.

(5) Each blended area shall have 0.500 inch minimum radius at each end of blend and 0.500 inch minimum transition radius into unblended material.

(6) Blended areas on two or more knife-edges shall be separated by minimum of one inch of unblended area.

b. Blend shall be smooth and continuous with an aspect ratio (length to depth) equal to 14 to 1 or greater.

c. Surface finish of all blends shall be as smooth as, or smoother than, adjacent non-grit blasted surfaces.

NOTE

Knife-edges are to be eddy current inspected as soon as probe is available.

d. Fluorescent penetrant inspect per T.O. 2-1-111 SPOP 84. Examine indications under white light at 10X magnification. No cracks allowed.

Legend for figure 1

1. Example of blended area (all knife-edges)
2. 1.000 inch minimum between blends on same or adjacent knife-edges
3. 0.500 inch minimum radius, all locations
4. 1.000 inch maximum blend length
5. Any amount of blending is reparable as long as final blend meets maximum allowable blend depth (6) and bend length (4) requirements
6. 0.075 inch maximum blend depth. Blends requiring depth greater than this are not serviceable and not reparable

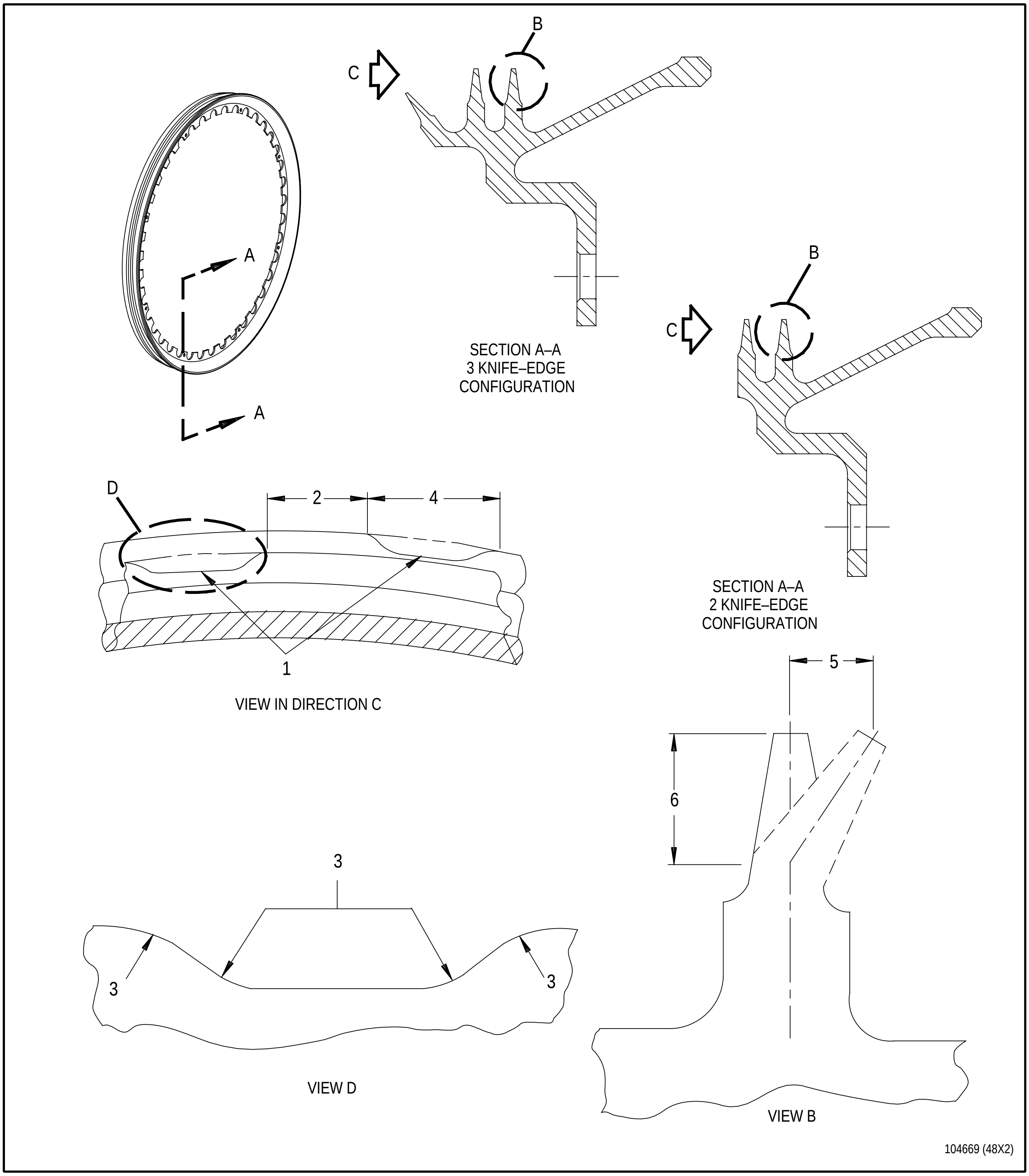


Figure 1. First Stage Turbine Air Seal - Knife-Edge Blend Repair

3. FIRST STAGE TURBINE AIR SEAL - KNIFE-EDGE COATING REPAIR.

NOTE

Vendor repair procedures listed in Qualified Repair Source List (QRSL) shall be kept current by incorporating all T.O. changes that affect repaired part. If vendor procedure requires revision to comply with T.O. changes, or if vendor desires to revise a procedure, then vendor must notify SA-ALC/LPFE of need for revision. SA-ALC/LPFE will authorize Pratt & Whitney to coordinate directly with vendor for review and update of procedure/revision listed in QRSL.

a. Perform proprietary repair as follows:

(1) Proprietary repairs for following distress modes may be performed only by qualified repair sources identified in QRSL. Refer to T.O. 2J-F100-53-1, WP 604 00.

- JGDFGZB Worn knife-edge coating

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE - RETAINING, BLADE, TURBINE, FIRST STAGE (FRONT)

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 24

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	27	6 - 7	23	9 - 23	23
2 - 4	23	8	27	24 Blank	23
5	27				

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Nondestructive Inspection	T.O. 2J-F100-9
Depot Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Grinding, Blending, Lapping, Buffing, and Peening	WP 091 00
Qualified Repair Source List (QRSL) Rear Compressor Drive Turbine	WP 604 00
Depot Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Seal - Air, Turbine, First Stage - Inspection	WP 301 00
Plate - Retaining, Blade, Turbine, Front, First Stage - Inspection	WP 302 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, CROCUS	P-C-458
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 382
GRIT, SILICON CARBIDE	NO. 60 (PMC 3053-31)

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
5	FIRST STAGE TURBINE BLADE RETAINING PLATE - SNAP REPAIR.	
	FIXTURE, MACHINE, 1ST STAGE TURBINE BLADE RETAINING PLATE	PWA 71523
	HOLDER, TEST STRIP, 1ST STAGE TURBINE BLADE RETAINING PLATE	PWA 71529
	PEDESTAL, AUTOMATED SHOTPEEN INSTALLATION	PWA 70449
	ADAPTER, SHOTPEEN, 1ST STAGE TURBINE BLADE RETAINING PLATE	PWA 71530
	COVER, SHOTPEEN, 1ST STAGE TURBINE BLADE RETAINING PLATE	PWA 71531
	COVER, SHOTPEEN, 1ST STAGE TURBINE BLADE RETAINING PLATE, 229	PWA 71532
	ADAPTER, GRITBLAST/PLASMA SPRAY, FIRST STAGE TURBINE BLADE RETAINING PLATE	PWA 71526
	PEDESTAL	PWA 71480
	MASK, GRITBLAST/PLASMA SPRAY, FIRST STAGE TURBINE BLADE RETAINING PLATE	PWA 71527
	MASK, GRITBLAST/PLASMA SPRAY, FIRST STAGE TURBINE BLADE RETAINING PLATE	PWA 71528

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
	GAGE, 1ST STAGE TURBINE BLADE RETAINING PLATE ----	PWA 71524
	MASTER, SET, 1ST STAGE TURBINE BLADE RETAINING PLATE -------------------------------	PWA 71525

ILLUSTRATED SUPPORT EQUIPMENT

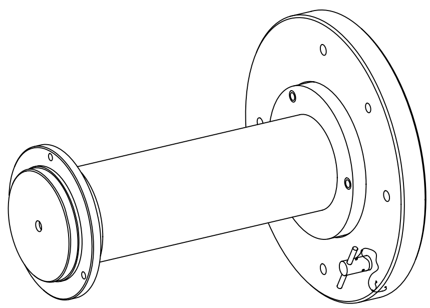


Figure T1. PWA 70449 PEDESTAL

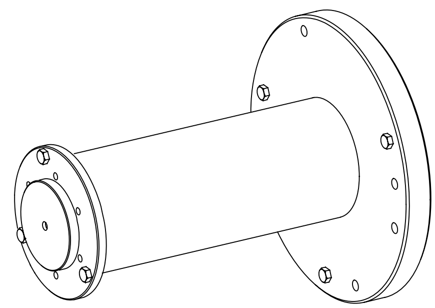


Figure T2. PWA 71480 PEDESTAL

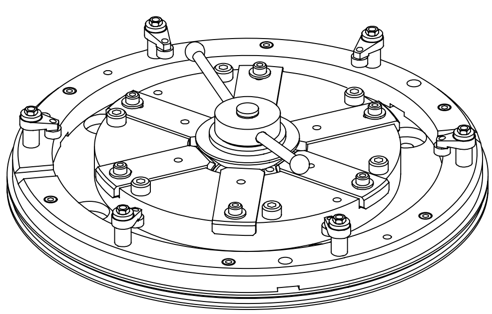


Figure T3. PWA 71523 FIXTURE

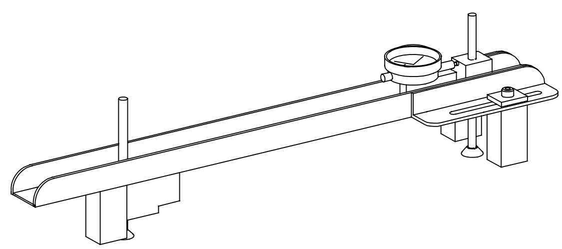


Figure T4. PWA 71524 GAGE

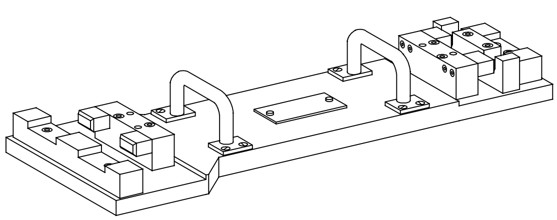


Figure T5. PWA 71525 MASTER

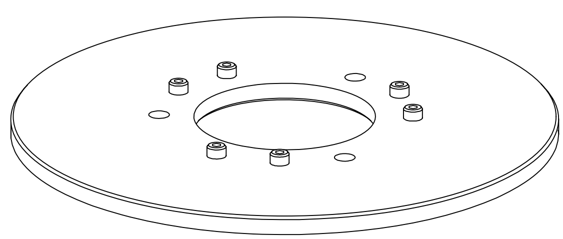


Figure T6. PWA 71526 ADAPTER

ILLUSTRATED SUPPORT EQUIPMENT (continued)

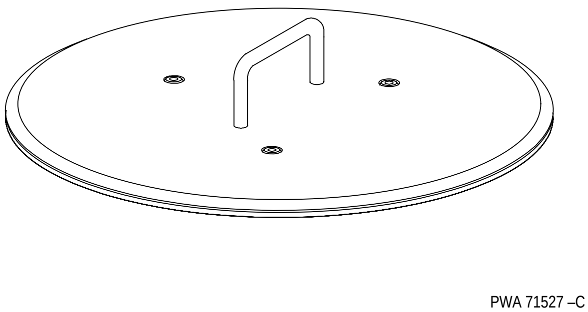


Figure T7. PWA 71527 MASK

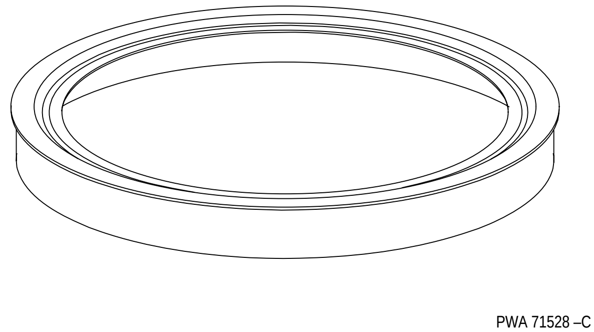


Figure T8. PWA 71528 MASK

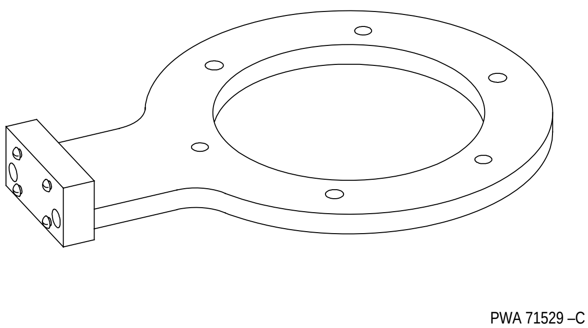


Figure T9. PWA 71529 HOLDER

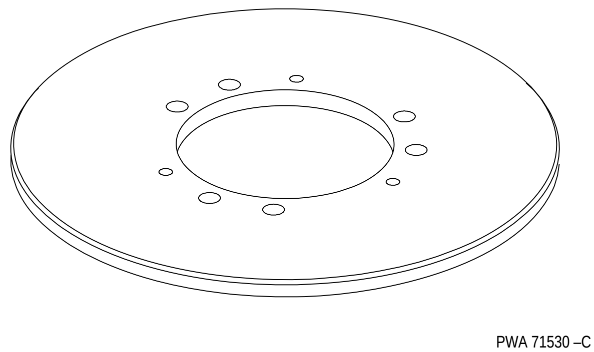


Figure T10. PWA 71530 ADAPTER

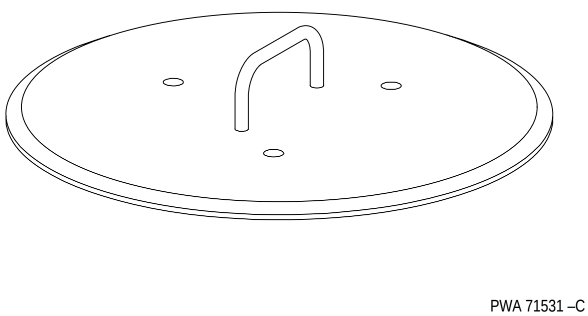


Figure T11. PWA 71531 COVER

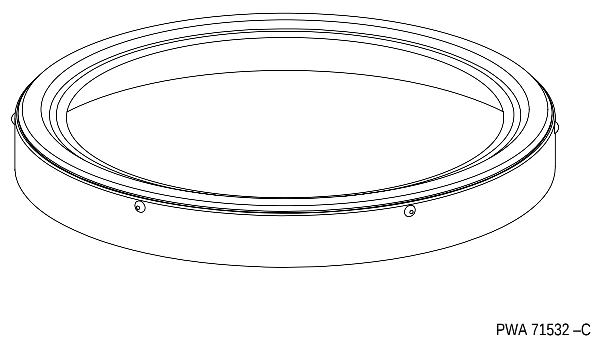


Figure T12. PWA 71532 COVER

1. INTRODUCTION.

a. This work package contains instructions for repair of 1st stage turbine blade front retaining plate.

2. FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE - KNIFE-EDGE BLEND REPAIR. (See Figure 1.)

CAUTION

Attempting to straighten knife-edge air seals may damage part.

NOTE

Knife-edge blending repairs are to be completed after aluminum oxide coating is removed. Coating must be reapplied once blend repair is complete.

a. All damage shall be blended using fine files and stones. Refer to T.O. 2J-F100-53-1, WP 091 00. Remove all pickup and raised metal. Observe following blend limits:

(1) Blending shall be limited to one continuous inch on any one knife-edge or two total inches of noncontinuous blends per knife-edge.

(2) Blending shall be limited to three total inches of noncontinuous blends for all knife-edges.

(3) Noncontinuous blends shall be separated by minimum of one inch of unblended knife-edge. One inch separation required for blends adjacent to bend with displacement from radial center plane greater than 0.010 but less than 0.050 inches.

(4) Maximum blend depth shall be 0.075 inch.

(5) Each blended area shall have 0.500 inch minimum radius at each end of blend and 0.500 inch minimum transition radius into unblended material.

(6) Blended areas on two or more knife-edges shall be separated by minimum of one inch of unblended area.

b. Blend shall be smooth and continuous with an aspect ratio (length to depth) equal to 14 to 1 or greater.

c. Surface finish of all blends shall be as smooth as, or smoother than, adjacent non-grit blasted surfaces.

NOTE

- Knife-edges require eddy current inspection after blend repair.
- Use fluorescent penetrant method until ECI capability is available.

d. Fluorescent penetrant or eddy current inspect knife-edges. Refer to WP 302 00 and T.O. 2J-F100-9, SWP 505 02. No cracks allowed.

Legend for figure 1

1. Example of blended area (all knife-edges)
2. 1.000 inch minimum between blends on same or adjacent knife-edges
3. 0.500 inch minimum radius, all locations
4. 1.000 inch maximum blend length
5. Any amount of blending is reparable as long as final blend meets maximum allowable blend depth (6) and bend length (4) requirements
6. 0.075 inch maximum blend depth. Blends requiring depth greater than this are not serviceable and not reparable

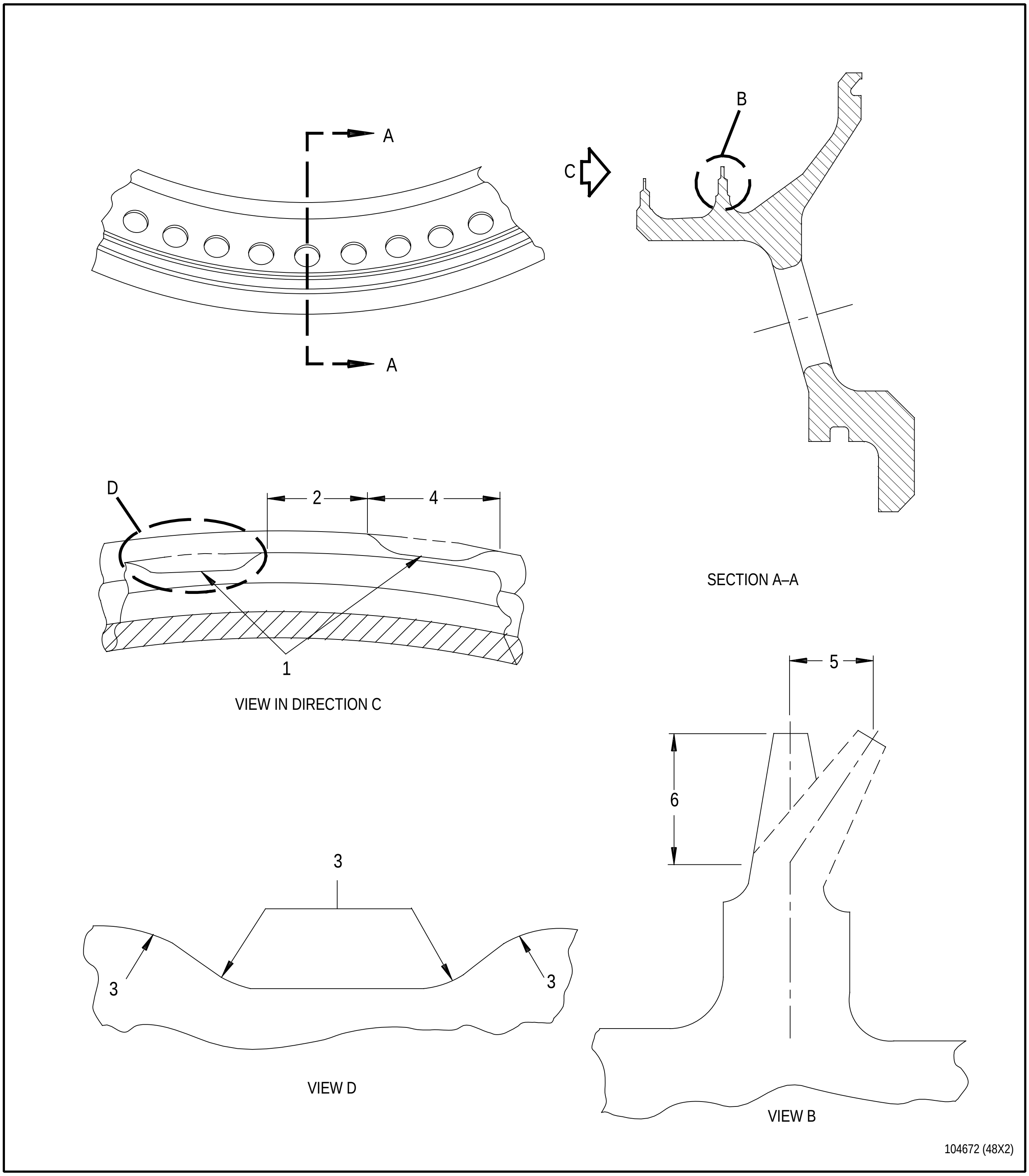


Figure 1. First Stage Turbine Blade Front Retaining Plate - Knife-Edge Blend Repair

3. FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE - KNIFE-EDGE COATING REPAIR.

NOTE

Vendor repair procedures listed in Qualified Repair Source List (QRSL) shall be kept current by incorporating all T.O. changes that affect repaired part. If vendor procedure requires revision to comply with T.O. changes, or if vendor desires to revise a procedure, then vendor must notify SA-ALC/LPFE of the need for revision. SA-ALC/LPFE will authorize Pratt & Whitney to coordinate directly with vendor for review and update of procedure/ revision listed in the QRSL.

a. Perform proprietary repair as follows:

(1) Proprietary repairs for following distress modes may be performed only by qualified repair sources identified in QRSL. Refer to T.O. 2J-F100-53-1, WP 604 00.

- JGDFGZB Worn knife-edge coating

NOTE

- Knife-edges require eddy current inspection once coating has been removed.
- Use fluorescent penetrant method until ECI capability is available.

b. Fluorescent penetrant or eddy current inspect knife-edges once coating has been removed. Refer to WP 302 00 and T.O. 2J-F100-9, SWP 505 02. No cracks allowed.

4. FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE - BLEND REPAIR (ALL OVER EXCEPT KNIFE EDGES).

(See Figure 2.)

a. Blend by local hand blending, using blending stones and crocus cloth. Refer to T.O. 2-1-111.

b. Width to depth ratio (aspect ratio) shall be 15 to 1.

c. All blending shall have 1/8 inch minimum radius.

d. Surface finish of all blends shall be as smooth as, or smoother than, original or adjacent surface finishes.

e. Fluorescent penetrant inspect all blending. Refer to T.O. 2-1-111 SPOP 82 and T.O. 2J-F100-9. No cracks allowed.

f. All blending must adhere to inspection limits of WP 302 00.

g. No blending in flange O.D. radius, flange I.D. radius, or cooling hole. See figure 2.

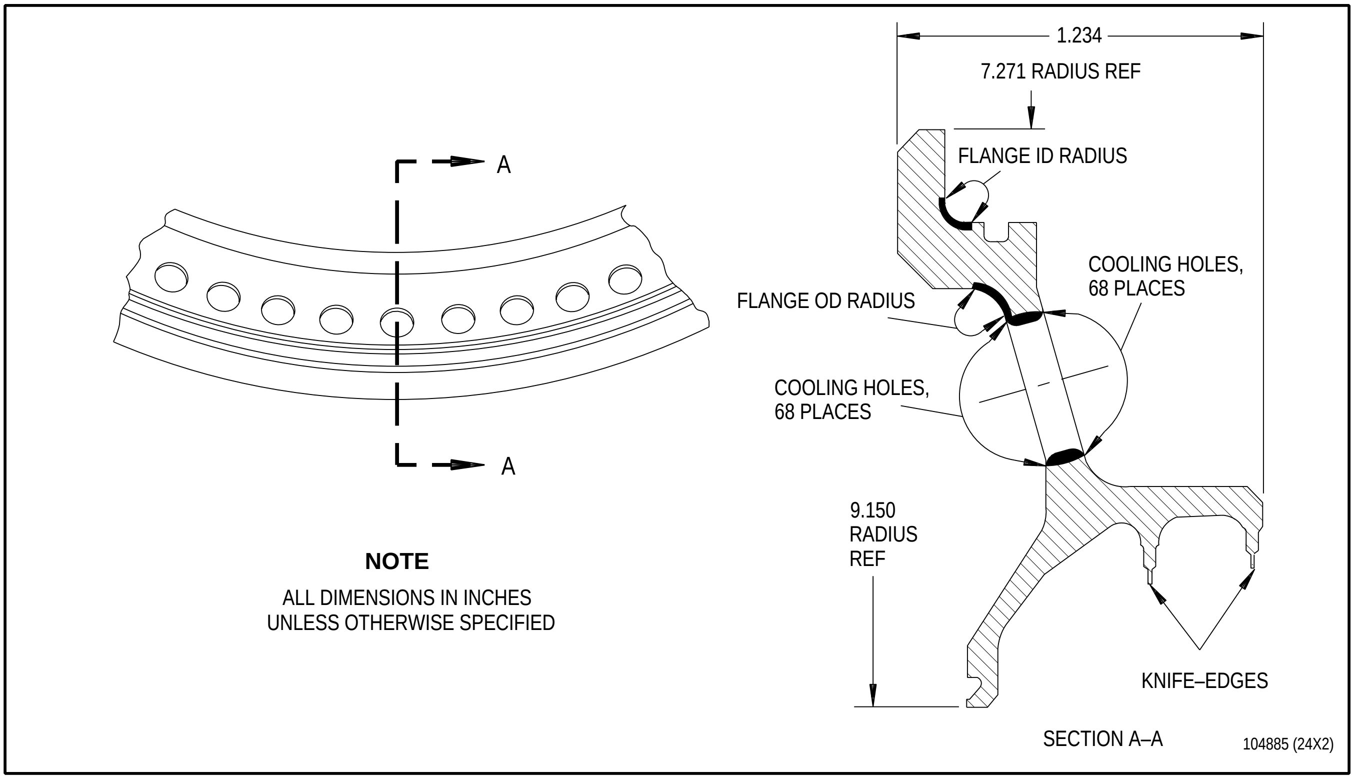


Figure 2. First Stage Turbine Blade Front Retaining Plate

5. FIRST STAGE TURBINE BLADE RETAINING PLATE - SNAP REPAIR.
(See Figures 3 through 10.)

a. Premachine worn snap surfaces to uniform depth using PWA 71523 fixture as shown on figure 3. See figure 4 for required dimensions.

b. Inspect per T.O. 2J-F100-9.

c. Place PWA 71529 test strip holder on PWA 70449 pedestal.

d. Install Almen test strip on PWA 71529 holder. Operate shotpeen nozzle and determine optimal pressure, angle and distance for shotpeen nozzle and equipment.

e. Remove PWA 71529 holder from PWA 70449 pedestal.

f. Install PWA 71530 shotpeen adapter on PWA 70449 pedestal.

g. Install PWA 71531 shotpeen cover and PWA 71532 shotpeen cover on shotpeen fixture per figure 5.

NOTE

New radius must be shotpeened.

h. Shotpeen per AMS 2430 with SAE 170 max cast steel shot, HRC 45-56, to a pressure intensity of 6A. See figure 4. Refer to T.O. 2-1-111, SPOP 501.

i. Remove all adapters and covers from pedestal.

j. Place PWA 71526 adapter on PWA 71480 pedestal.

k. Place turbine retaining plate on PWA 71526 adapter and install PWA 71527 mask and PWA 71528 mask. See figures 4 and 8.

l. Grit blast coating area using No. 60 silicon carbide grit. Use 30 to 60 psi blasting pressure. No grit blast allowed outside of coating area.

m. Remove grit blast masking.

n. Vacuum any residual grit in preparation for plasma spray.

o. Install PWA 71526 plasma spray adapter, PWA 71527 mask, and PWA 71528 mask on PWA 70449 plasma spray pedestal per figure 4.

p. Plasma spray per PWA 53-37. See figure 9. Refer to T.O. 2-1-111 for plasma spray procedures.

q. Remove plasma spray masking.

r. Finish machine 15.571 to 15.574 inches diameter using PWA 71523 machining fixture. See figures 3 and 10 for finish dimensions.

s. Verify dimensions using PWA 71524 gage and PWA 71525 master gage.

t. Permanently identify part with beehive symbols per T.O. 2-1-111, SPOP 401 shallow electrolytic etch.

u. Clean per T.O. 2-1-111, SPOP 208.

v. Apply antigallant, PWA 36545-3, per T.O. 2-1-111, SPOP 748. Wipe off excess material before baking.

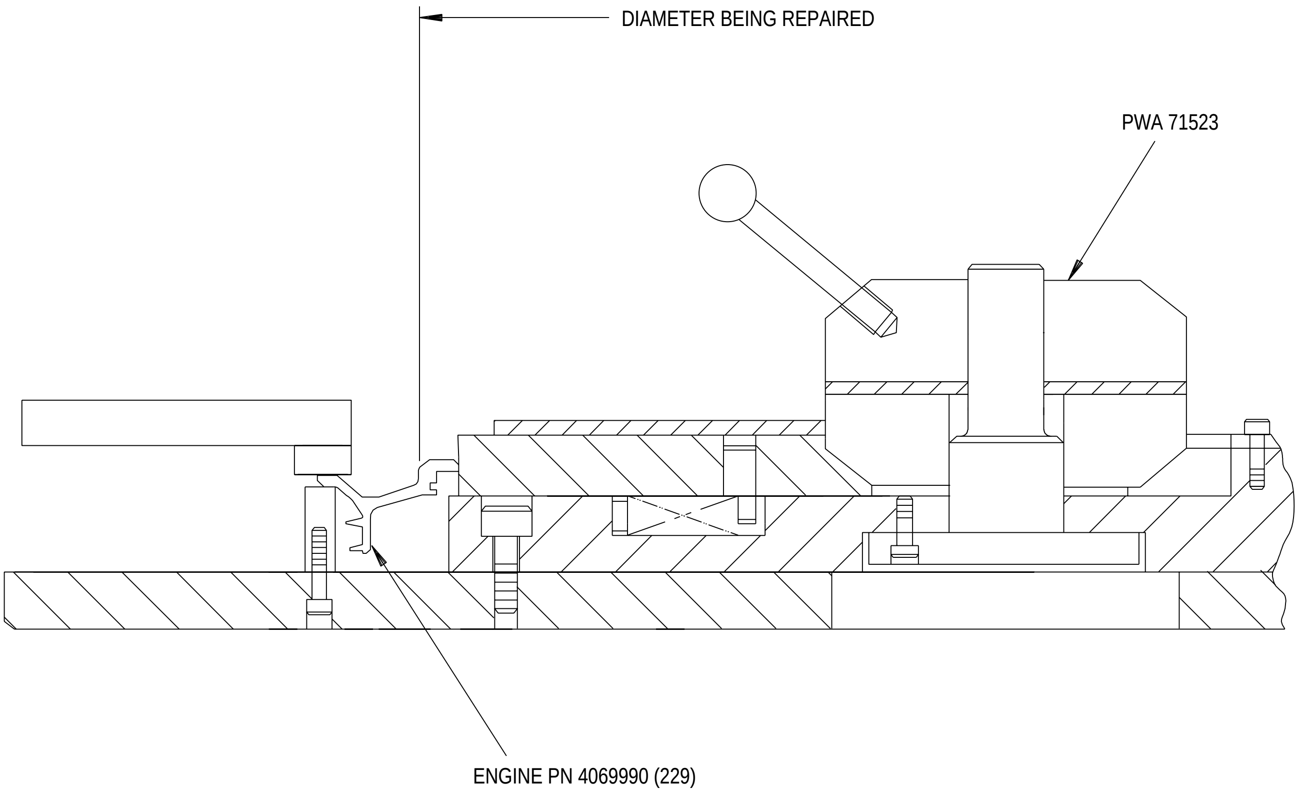


Figure 3. First Stage Turbine Blade Retaining Plate Premachine Fixture

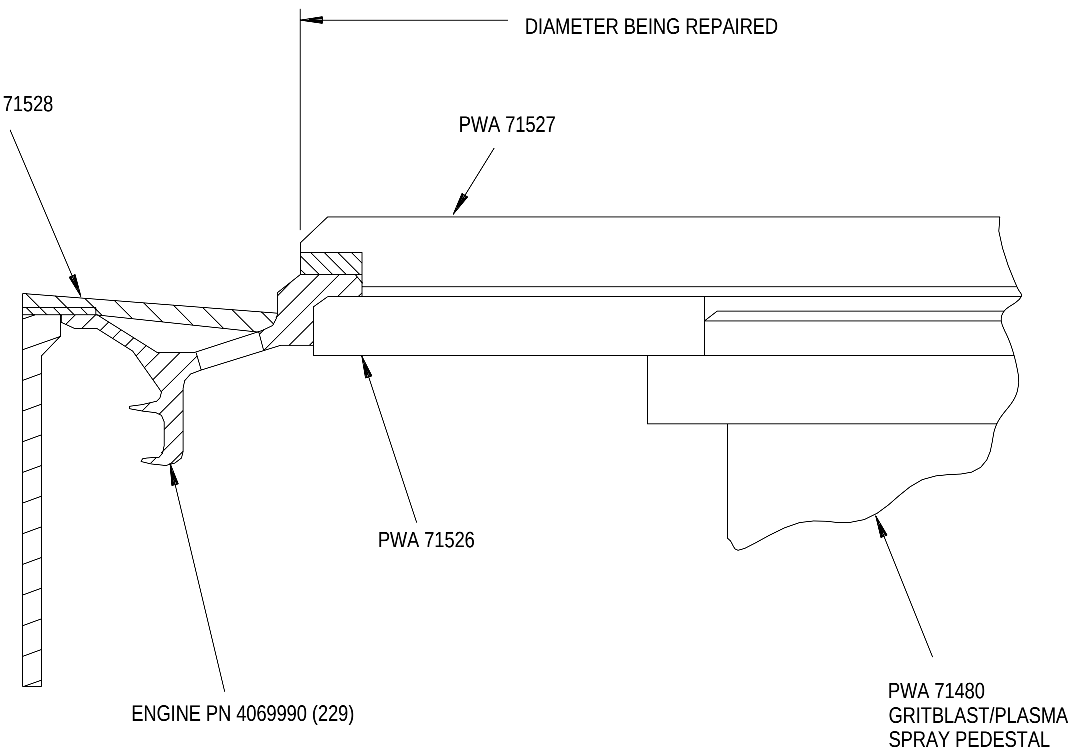


Figure 4. First Stage Turbine Blade Retaining Plate Grit Blast/Plasma Spray fixture

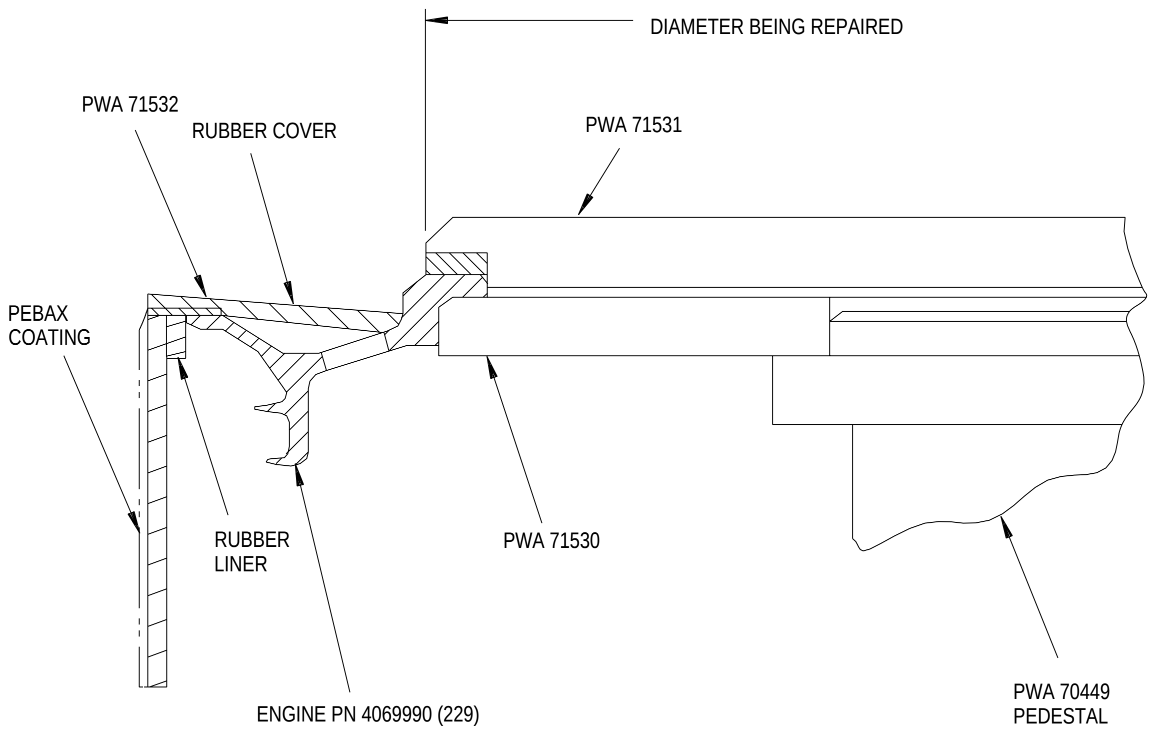


Figure 5. First Stage Turbine Blade Retaining Plate Shotpeen Fixture

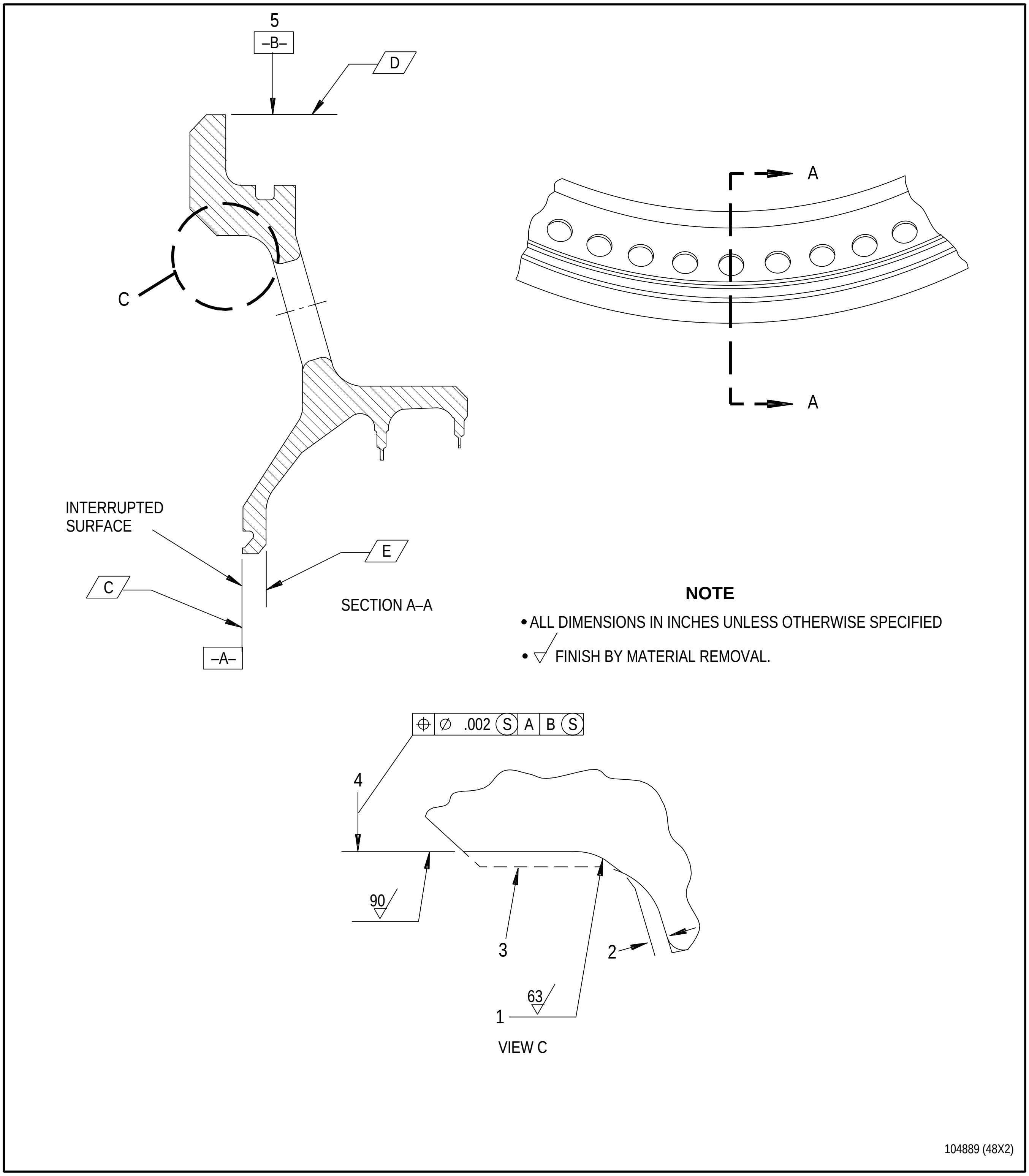


Figure 6. First Stage Turbine Blade Retaining Plate - Premachine

Legend for figure 6

NOTE

- Unless otherwise specified, Break edges 0.003 to 0.005 inch.
- Unless otherwise specified, all dimensions apply when Surface C is flat within 0.001 inch and Diameter D maintain a clearance envelope of 14.539 inch basic diameters in free state or constrained. Constraint contact allowed only on Surfaces C and E and Diameter D.
- In free state, Surface C shall be flat within 0.010 inch and Diameters A and X are 16.028 to 16.042 inch and 15.957 to 15.970 inch diameters respectively.
- Surface texture per T.O. 2-1-111.

1. 0.090 to 0.110 inch radius.
2. 0.000 to 0.010 inch.
3. Original surface (reference).
4. 15.554 to 15.557 inch diameter. This diameter must be located within 0.002 inch diameter of true position regardless of feature size related to Datum A and Datum B regardless of feature size.
5. 14.544 to 14.540 inch diameter (reference).

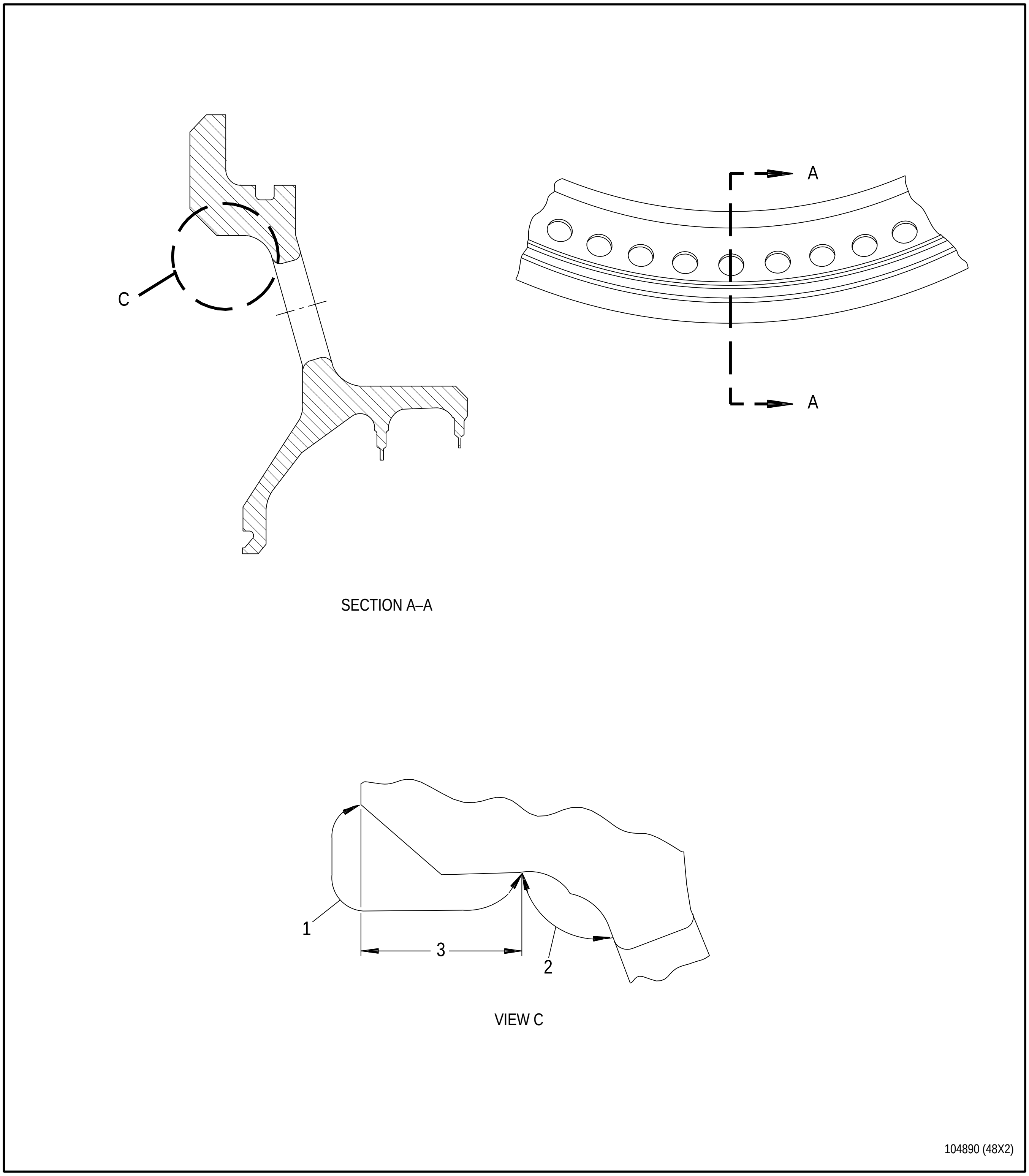


Figure 7. First Stage Turbine Blade Retaining Plate - Shot Peening

Legend for figure 7

1. Peen optional and may be incomplete.
2. Shot peen per test.
3. 0.250 inch.

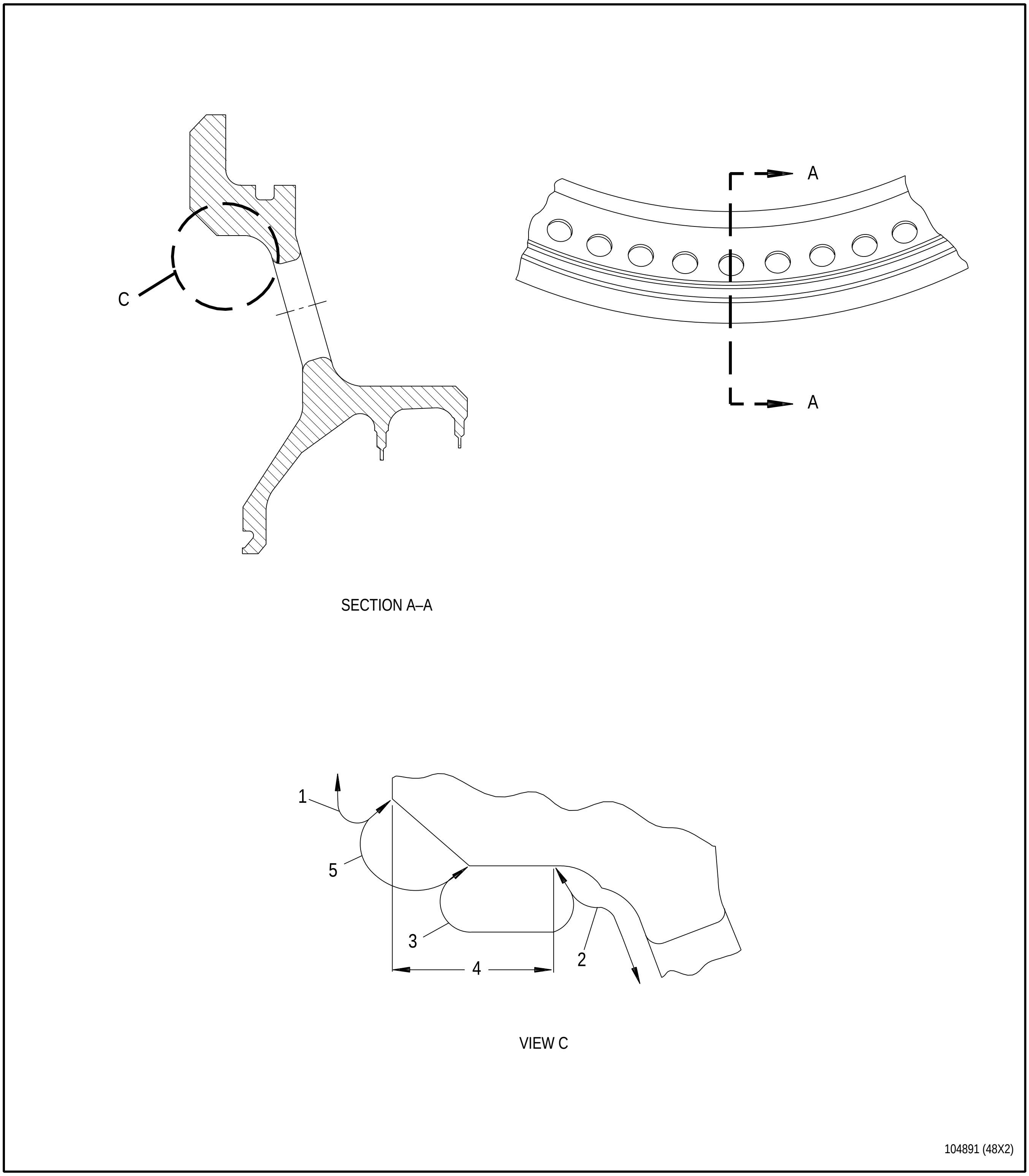


Figure 8. First Stage Turbine Blade Retaining Plate - Grit Blast

Legend for figure 8

1. Mask area using PWA 71527 mask. No grit blast allowed.
2. Mask area using PWA 71528 mask. No grit blast allowed.
3. Grit blast surface per text.
4. 0.245 - 0.255 inch.
5. Grit blast optional and may be incomplete.

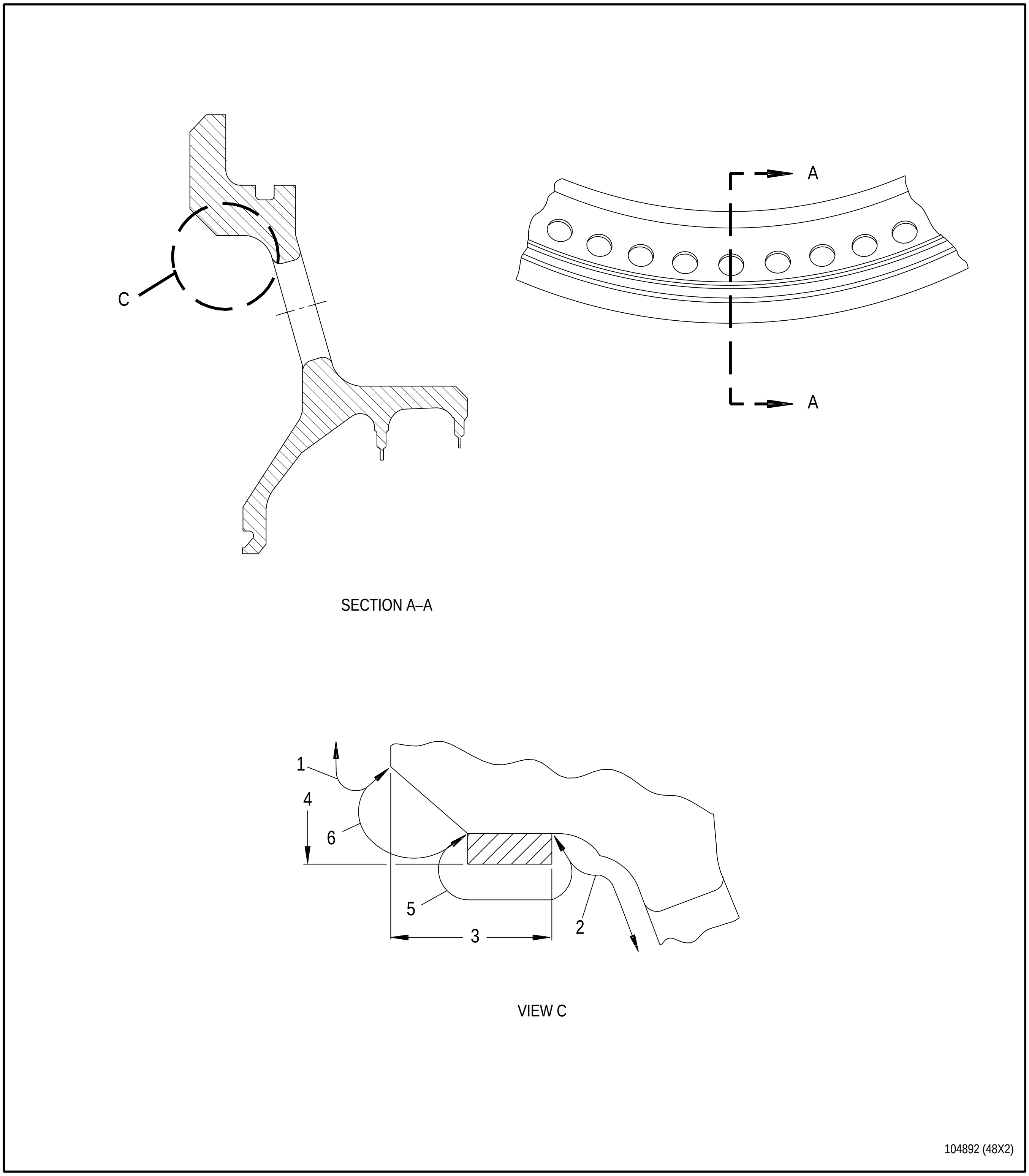


Figure 9. First Stage Turbine Blade Retaining Plate - Plasma Spray

Legend for figure 9

1. Mask area using PWA 71527 mask. No plasma spray allowed.
2. Mask area using PWA 71528 mask. No plasma spray allowed.
3. 0.245 to 0.255 inch.
4. Plasma spray to 15.580 inch diameter minimum.
5. Plasma spray per text.
6. Plasma spray optional and may be incomplete.

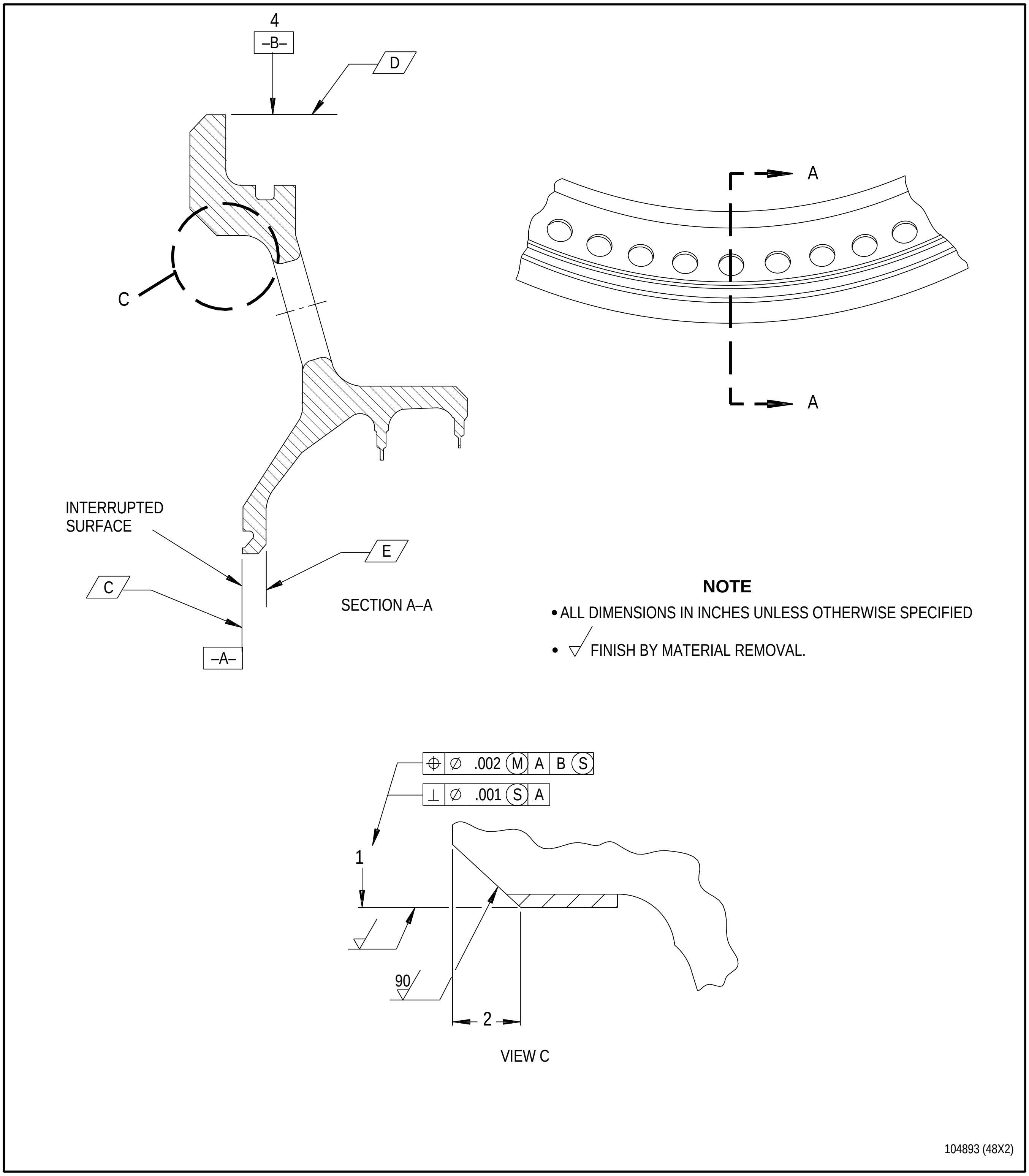


Figure 10. First Stage Turbine Blade Retaining Plate - Final Machining

Legend for figure 10

NOTE

- Surface texture per T.O. 2-1-111.
- Break edges 0.003 to 0.005 inch.
- Unless otherwise specified, all dimensions apply when Surface C is flat within 0.001 inch and Diameter D maintains a clearance envelope of 14.539 inch basic diameter in free state or constrained. Constraint contact allowed only on Surfaces C, and E and Diameter D.

1. 15.571 to 15.574 inches diameter. This diameter should be located within 0.002 inch diameter of true position at maximum material condition related to Datum A and Datum B regardless of feature size. This diameter also must be perpendicular within 0.001 inch diameter regardless of feature size, related to Datum A.
2. Chamfer 0.110 to 0.120 inch X 45 ± 2 degrees.
3. No plasma spray allowed on parent material.
4. 14.540 to 14.544 inch diameter (reference).

WORK PACKAGE

TECHNICAL PROCEDURES

DISK - TURBINE, FIRST STAGE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 8

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23	3 - 4	12	5 - 8 Added	23

REFERENCE MATERIAL REQUIRED

Title	Number
Nondestructive Inspection	T.O. 2J-F100-9
Depot Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Compound, Antigalling (PWA 36545) Application (SPOP 748)	SWP 098 07
Depot Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine - Dynamic Balancing	WP 702 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, ABRASIVE, 400 GRIT	400 GRIT SILICON CARBIDE
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 392

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for repair of first stage turbine disk.

2. FIRST STAGE TURBINE DISK - BLENDING DOWEL PIN HOLES.

(See Figures 1 and 2.)

a. Blend dowel pin holes as follows: (See figures 1 and 2.)

(1) Holes may be blended up to 0.001 inch over maximum.

(2) Blend affected area for approximately 45 to 60 seconds using No. 400 grit abrasive cloth, medium pressure, and clockwise rotary motion until a clean and shiny surface appears.

(3) Polish blended area using No. 400 grit abrasive cloth, medium pressure, and clockwise rotary motion for approximately one to two minutes to obtain a smooth, shiny surface for reinspection.

(4) Fluorescent penetrant inspect after blending. Refer to T.O. 2J-F100-9. No cracks allowed.

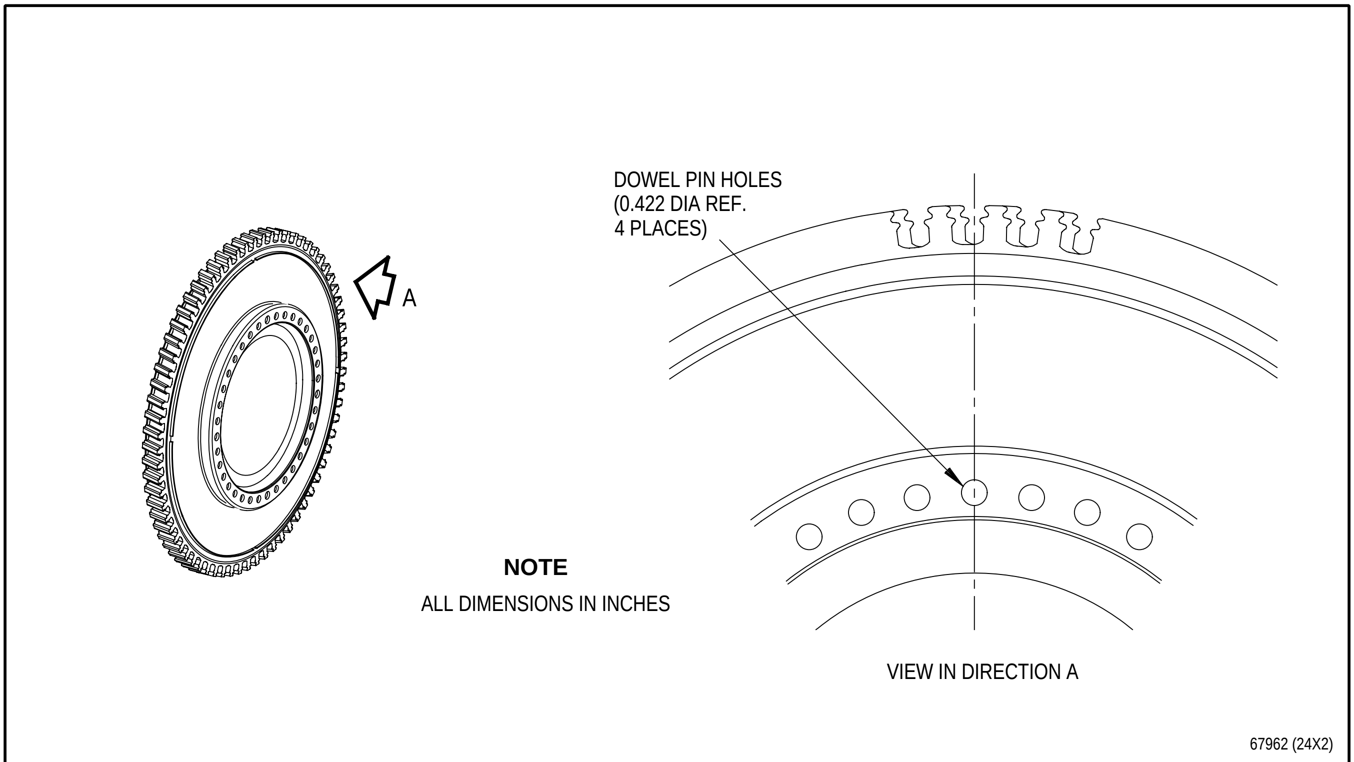


Figure 1. First Stage Turbine Disk - Blending Dowel Pin Holes

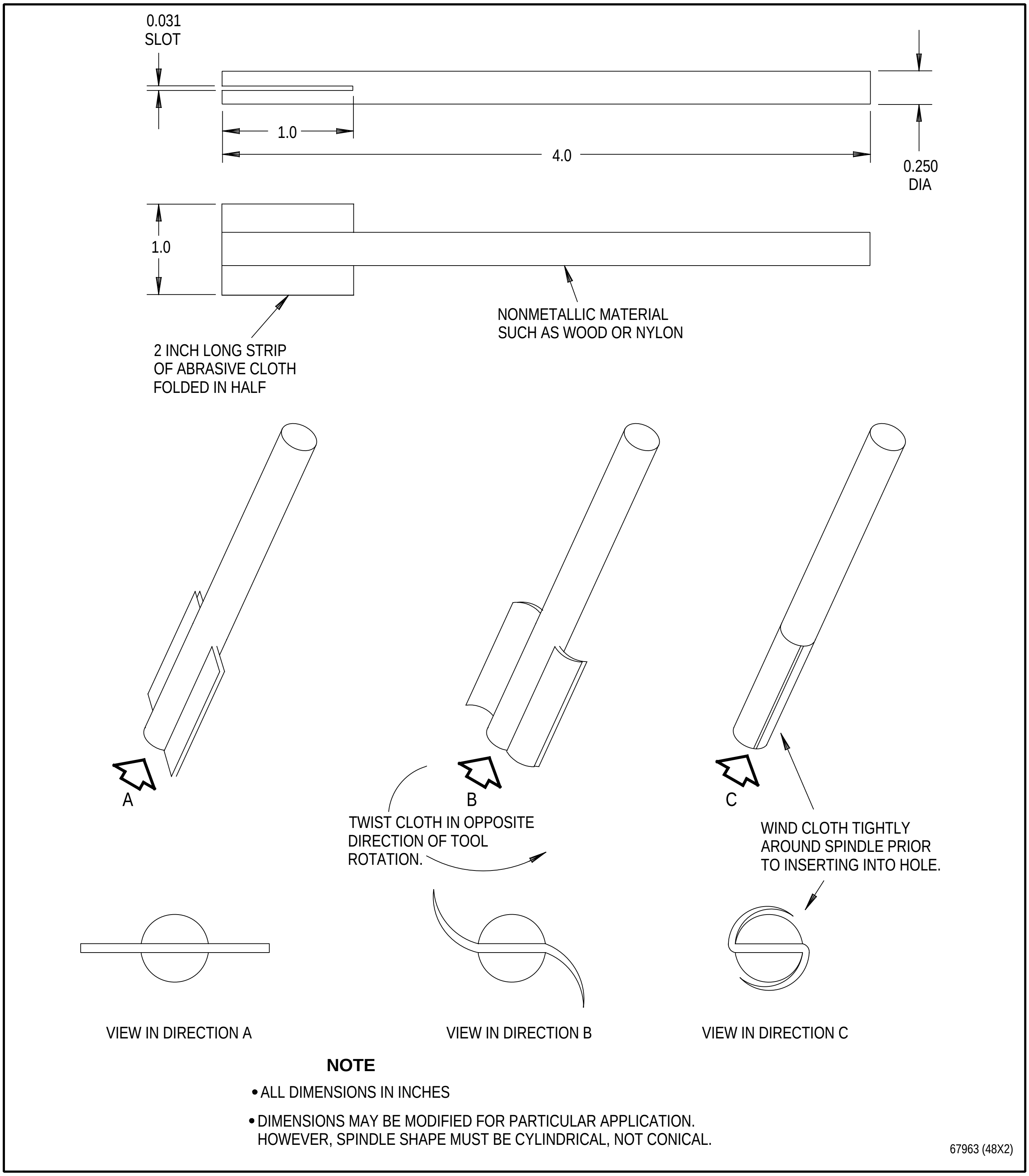


Figure 2. Spindle and Abrasive Cloth for Hole Blending

3. ANTIGALLING COMPOUND — APPLICATION. (See Figure 3.)

a. Apply PWA 36545 antigalling compound per figure 3 and T.O. 2J-F100-53-1, SWP 098 07.

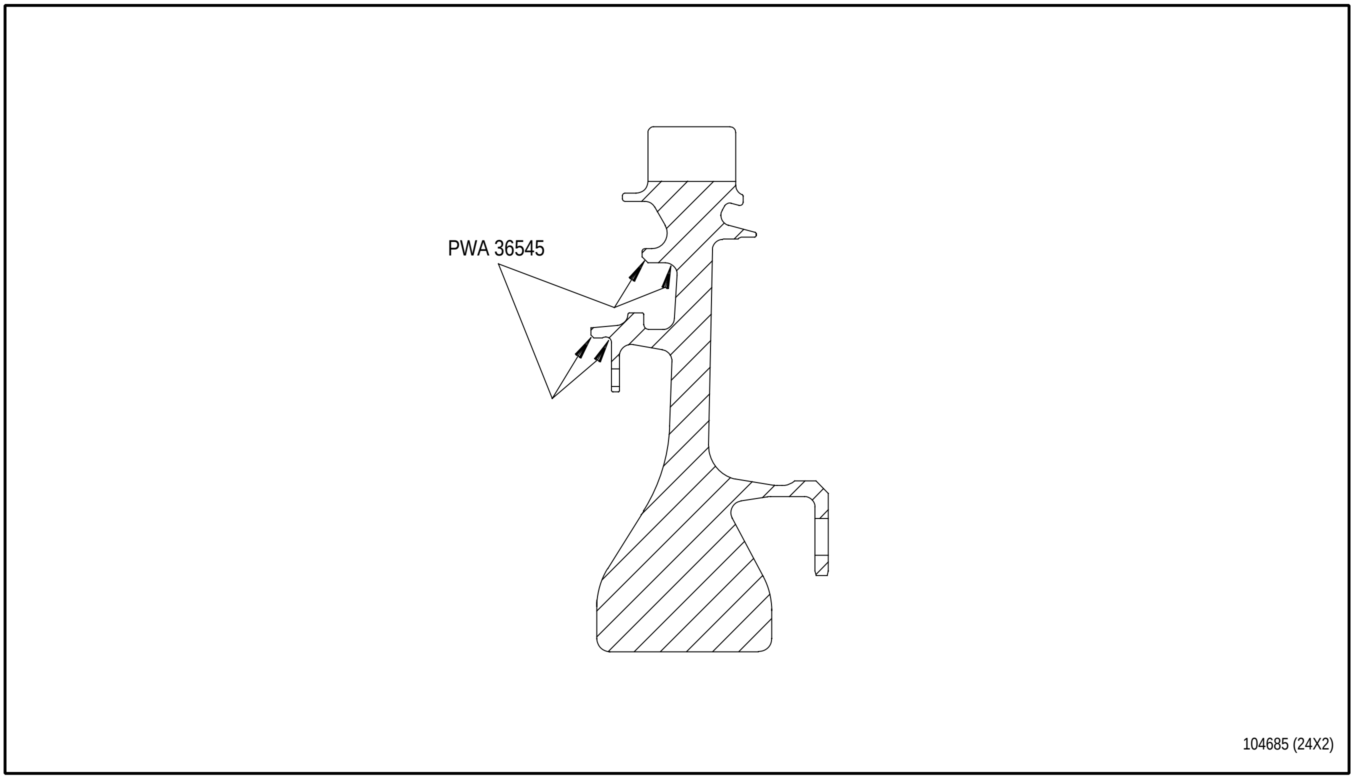


Figure 3. Antigalling Compound - Application

4. FIRST STAGE TURBINE DISK - BALANCE WEIGHT FLANGE TANG REMOVAL.

(See Figures 4 and 5.)

CAUTION

Straightening bent flange tangs will damage part.

NOTE

- Number of tangs that may be removed by this procedure is not limited by structural integrity, but removing several tangs from single disk could make balancing assembly difficult.
- Long air seal mounting tangs are limited to corner blend repair.

a. Remove tangs as follows. No more than six short tangs and no two adjacent tangs shall be removed.

b. Remove tangs bent inboard of rivet hole by blending to remove at least 50 to 90% of rivet hole. See figure 4. If tang is bent beyond rivet hole toward the OD of disk, remove tang per step c.

c. Remove tangs that are excessively bent, sheared, or cracked outboard of rivet hole by blending up to but not beyond the 13.765 to 13.785 inch diameter. It is preferred to stay below this diameter by 0.005 inch. See figure 4.

NOTE

- Repair is limited to removal of balance weight rivet hole.
- Repair is limited to one corner on any particular tang not to exceed four locations.

d. Blend air seal mounting tang to center of balance weight rivet hole and up to but not beyond the 13.765 to 13.785 inch diameter. It is preferred to stay below this diameter by 0.005 inch. See figure 5.

e. Fluorescent penetrant inspect. Refer to T.O. 2J-F100-9.

f. Dynamic balance rotor and stator assembly per WP 702 00.

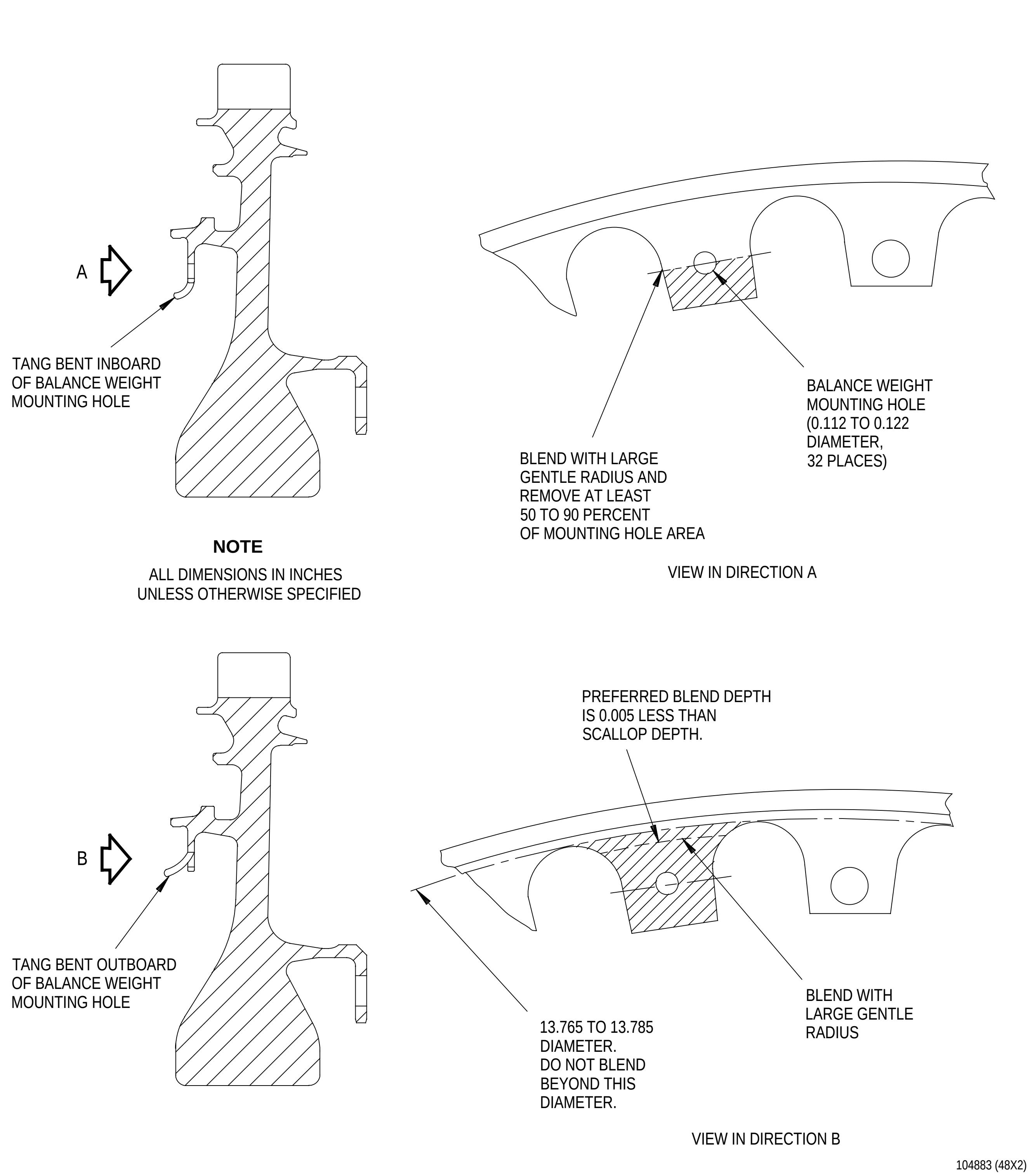


Figure 4. First Stage Turbine Disk - Balance Weight Flange Tang Removal

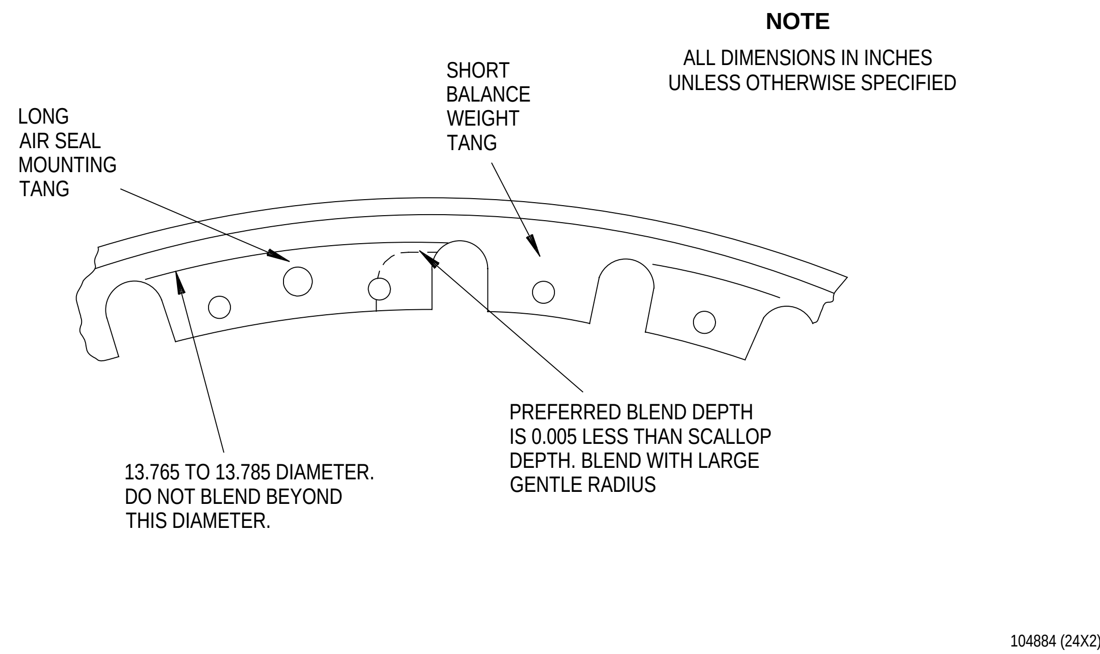


Figure 5. Air Seal Mounting Tang - Blend Repair

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE ASSEMBLY - RETAINING, BLADE, TURBINE, REAR, FIRST STAGE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 4	22				

REFERENCE MATERIAL REQUIRED

Title	Number
Stand Maintenance Procedures - - - - - - - - - - - - - - - - - - -	T.O. 2-1-111
Introduction and General Information - - - - - - - - - - - - - -	T.O. 2J-F100-53-1
Grinding, Blending, Lapping, Buffing and Peening - General Procedures -	WP 091 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
CLOTH, ABRASIVE, CROCUS	P-C-458

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
RIVET	AS3230-005	2

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
3	FIRST STAGE TURBINE REAR RETAINING PLATE ASSEMBLY (TYPICAL PN 4079621) - RIVET AND DAMPER REPLACEMENT	
	RIVET SET, 1ST STAGE TURBINE BLADE RETAINING PLATE -	PWA 55994

ILLUSTRATED SUPPORT EQUIPMENT

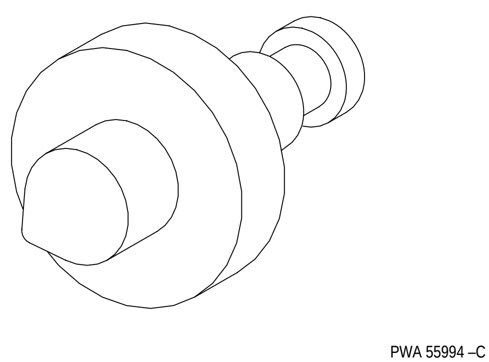


Figure T1. PWA 55994 RIVET SET

1. INTRODUCTION.

a. This work package contains instruction for repair of first stage turbine blade rear retaining plate assembly (typical PN 4079621).

2. FIRST STAGE TURBINE BLADE REAR RETAINING PLATE ASSEMBLY (TYPICAL PN 4079621) - KNIFE EDGE BLENDING.

a. Blend all sharp edges from knife edge using blending stones and crocus cloth. Refer to T.O. 2J-F100-53-1, WP 091 00.

CAUTION

Straightening of knife edge seals is prohibited and will result in damage.

b. Blend knife edges using following criteria:

- Maximum blend depth is 0.020 inch and depth to width ratio of fourteen to one.
- All blends shall be separated by 0.250 inch circumferentially on same knife edge.
- Maximum depth of any blend shall not extend into platform.
- Both ends of each blend repair shall have minimum of 0.125 inch radius.
- Blend area must be smooth or smoother than adjacent unblended area.

c. Fluorescent penetrant inspect. Refer to T.O. 2-1-111, SPOP 82. No indications permitted.

3. FIRST STAGE TURBINE REAR RETAINING PLATE ASSEMBLY (TYPICAL PN 4079621) - RIVET AND DAMPER REPLACEMENT.

(See Figure 1 and Table 1.)

CAUTION

Failure to excercise care during drilling operation may result in damage to damper or retaining plate.

a. Drill retaining flare(3) of rivet(4) using No. 54 carbide or colbalt drill. Do not damage parent material during drilling operation.

b. Remove rivet and damper(1) with standard drift.

c. Select correct damper, see table 1. Install damper and rivet per figure 1.

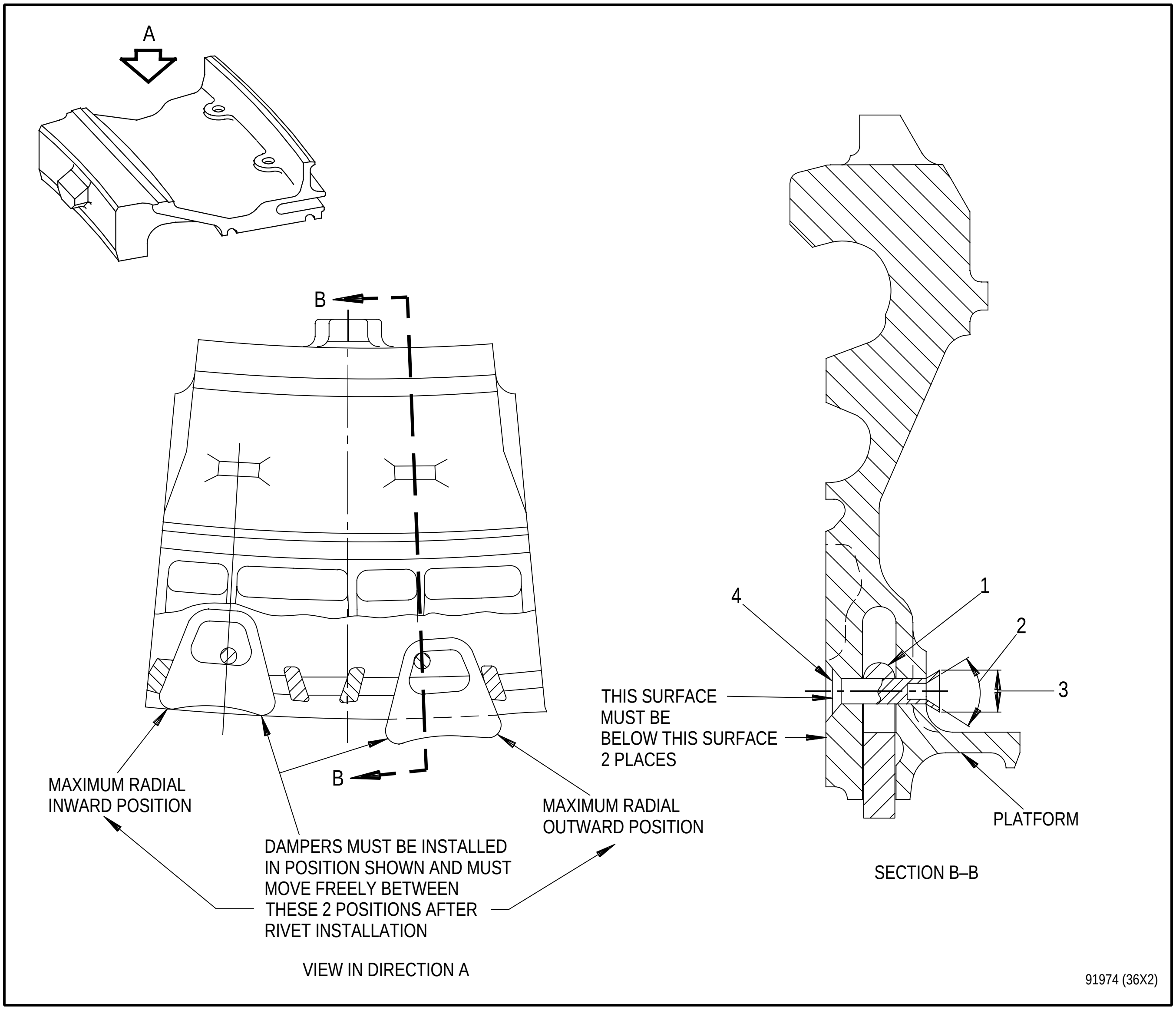
d. Flare rivets to requirements of figure 1 using CP-0214-CELEL riveter, P089495 flush set from Chicago Pneumatic Tool Co. and PWA 55994 rivet set or equivalent. No cracking of rivet flare permitted.

e. Ensure dampers move freely.

Table 1. First Stage Turbine Rear Retaining Plate Assembly and Damper - Usage

Retaining Plate Assembly Part Numbers	Damper Part Numbers
4080632 4079621 4077403 4066777	4079617
4079003	4055953

f. When PN 4077403 is repaired using PN 4079617 damper, reidentify retaining plate assembly to PN 4080632 per T.O. 2-1-111, SPOP 401. Vibra peen in area of old part number.



1. Damper, typical PN 4079617 (2 required)
2. 64 degree reference (2 places)
3. Retaining flare, 0.080 inch minimum diameter.
   Flare rivet securely. No cracking permitted (2 places)
4. Rivet, PN AS3230-005 (2 required)

Figure 1. First Stage Turbine Rear Retaining Plate Assembly (Typical PN 4079621) - Rivet and Damper Replacement.

WORK PACKAGE

TECHNICAL PROCEDURES

DUCT AND SUPPORT SET, TURBINE, FIRST STAGE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 6

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures - - - - - - - - - - - - - - - - - -	T.O. 2-1-111

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Beeswax	C-B-191
Pencil (crayon), silver, metal marking (hard)	Colorbrite No. 2101 or Color-Tex No. 1843 or Anadel No. 1936

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
PIN-STRAIGHT, HEADED, SLAB	4072926	AS REQUIRED
PIN-STRAIGHT, HEADED, SLAB	4080705	AS REQUIRED
SEAL - TURBINE STATOR, 1ST STAGE	4060689	18

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. **INTRODUCTION**

a. This work package contains instructions for repair of 1st stage turbine duct and support set.

2. **FIRST STAGE TURBINE DUCT AND SUPPORT SET - SEAL REPLACEMENT** (See Figures 1 and 2.)

a. Number segments and adjacent support positions, one through 18, in clockwise direction, aft looking forward, using Colorbrite No. 2101 silver pencil or equivalent. (See figure 1.)

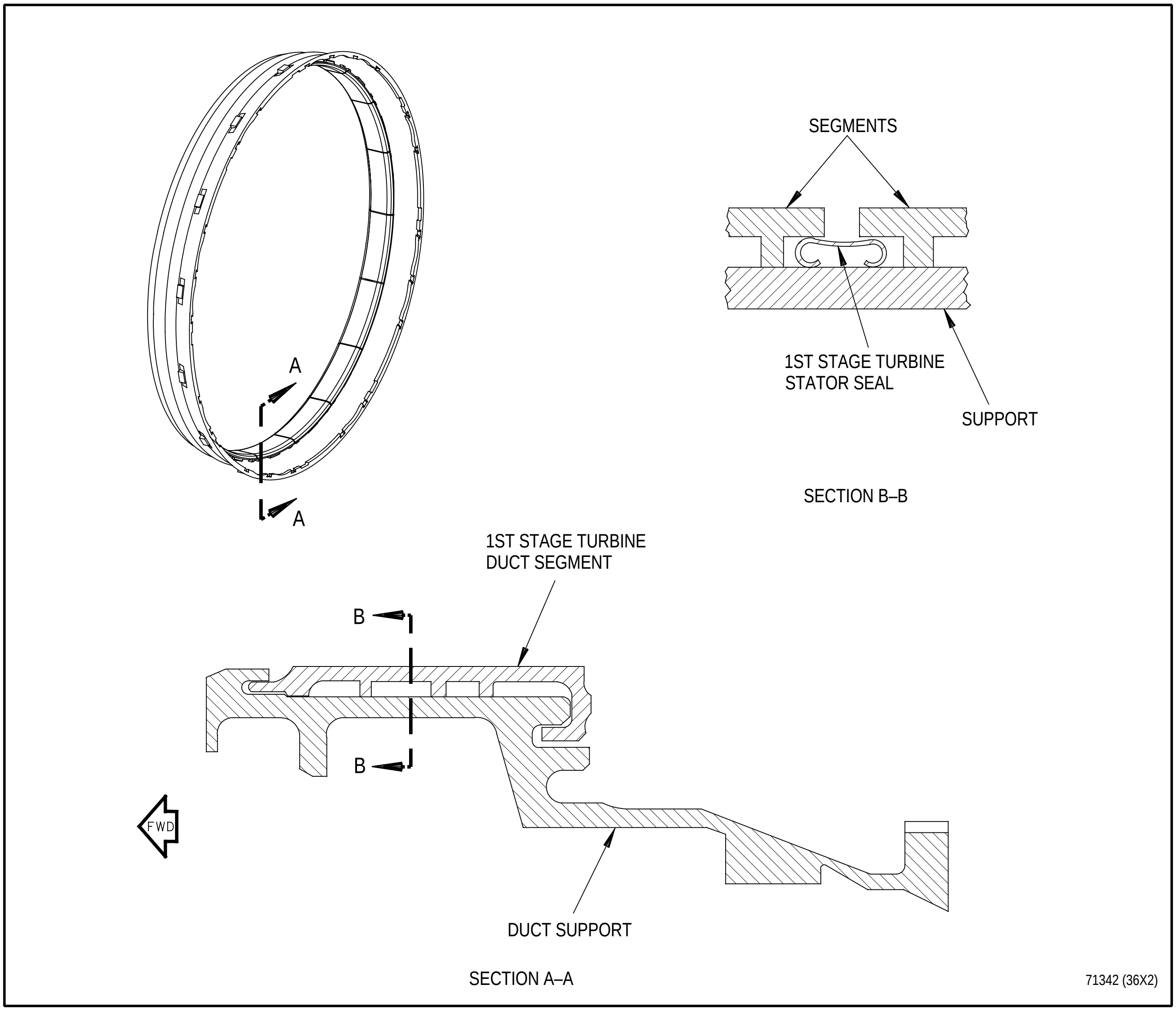


Figure 1. First Stage Turbine Duct and Support Set - Seal Replacement

b. Remove segments from support by drifting rearward using nylon or brass drift and hammer.

c. Remove and discard 18 stator seals.

CAUTION

Failure to install segments in their original positions can result in damage to turbine hardware.

d. Install segments in their original positions using new stator seals as follows:

(1) Arrange segments in order marked in step a.

(2) Tap one corner of 1st segment down to seat in support using nylon or brass drift and hammer while leaving other corner up.

(3) Install new stator seal under raised corner of segment with flat side of seal facing inboard (see figure 1). Use beeswax to hold seal in place.

NOTE

Segments may curl more than curvature of support. Nylon or plastic tipped C-clamps may be used to align ends of segments as they are tapped into position.

(4) Install 2nd segment by aligning with 1st segment and seal and tapping both corners down concurrently to avoid damaging seal. If necessary, install nylon or plastic tipped C-clamps, McMaster-Carr PN 5134A15 or equivalent, to align segments with support (see figure 2). Leave other end of 2nd segment raised.

(5) Install remaining segments and seals using same procedure.

(6) Inspect to ensure segments are fully seated under support flange and aft hooks are engaged.

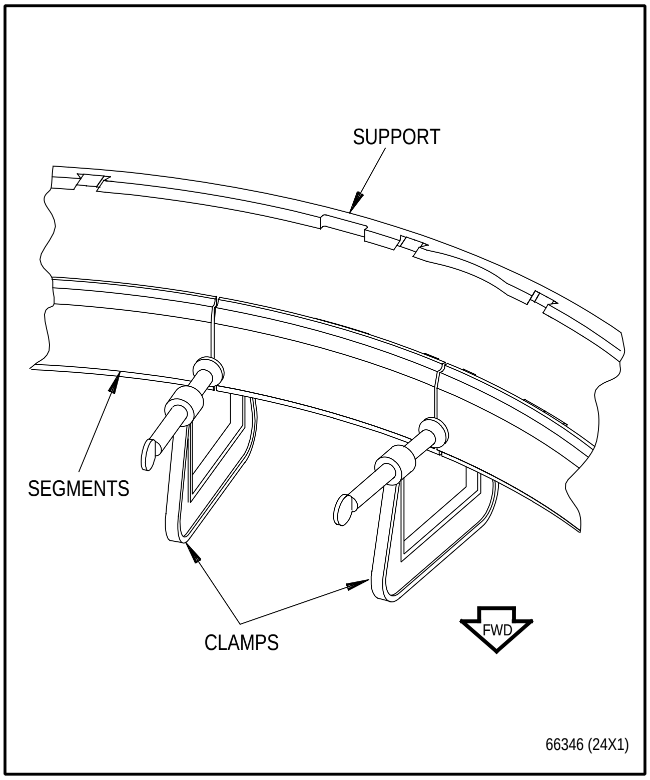


Figure 2. Segment Installation Using C-Clamps

3. FIRST STAGE TURBINE DUCT AND SUPPORT SET - ANTIROTATION PIN REPLACEMENT

a. Remove segments from support per paragraph 2.

b. Remove antirotation pin using 0.100 inch diameter drift.

NOTE

There are two duct and support set configurations requiring different part number pins.

c. Select correct part number pin for applicable configuration.

d. Chill replacement pin.

e. Install replacement pin using 0.100 inch diameter drift. Drive pin until T-head is flush with support ring.

f. Stake pin. Refer to T.O. 2-1-111.

g. Install segments per paragraph 2.

WORK PACKAGE

TECHNICAL PROCEDURES

PLATE, RETAINING, BLADE, TURBINE, SECOND STAGE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	27	5	23	7	27
3	5	6	17	8 - 13 Added	23
4	17			14	27

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Nondestructive Inspection	T.O. 2J-F100-9
Plate, Retaining, Blade, Turbine, Second Stage, Assembly (Typical PN 4057239) Inspection	WP 523 00
Plate, Retaining, Blade, Turbine, Second Stage, Assembly (Typical PN 4067069) Inspection	SWP 523 01
Depot Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Grinding, Blending, Lapping, Buffing, and Peening	WP 091 00
Qualified Repair Source List (QRSL) Rear Compressor Drive Turbine	WP 604 00
Depot Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Plate Assembly - Retaining, Blade, Turbine, Second Stage - Inspection	WP 309 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229-541	28 SEP 98	O/I	Modification of PWA 55760 Fixture For Improved Part Retention, F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 92QC109)

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
BUSHING	2116034	AS REQUIRED
DAMPER	4079618	AS REQUIRED
RIVET	637287	AS REQUIRED

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Second Stage Turbine Blade Retaining Plate Assembly - Rivet, Bushing and Damper Replacement	
	Fixture, 2nd stage turbine blade retaining plate damper replacement - - - - - - - - - - - -	PWA 57484 or PWA 55760

ILLUSTRATED SUPPORT EQUIPMENT

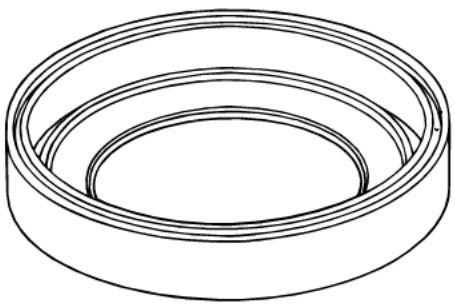

PWA 55760 –C

Figure T1. PWA 55760 Fixture

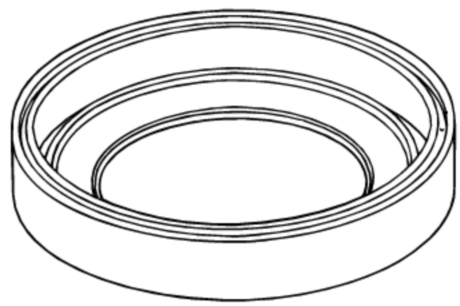

PWA 57484 –C

Figure T2. PWA 57484 Fixture

1. INTRODUCTION.

a. This work package contains instructions for repair of 2nd stage turbine blade retaining plate assembly.

2. SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - RIVET, BUSHING, AND DAMPER REPLACEMENT.

(See Figures 1 and 2.)

NOTE

Dampers being replaced for wear require replacement of each affected damper, bushing, and rivet. Missing or cracked dampers require replacement of select 2nd stage turbine blades in addition to each affected damper, bushing, and rivet.

a. Determine 2nd stage turbine blade replacement, if required, as follows:

(1) Remove two 2nd stage turbine blades contacted by each missing or cracked damper being replaced (see Figure 1).

(2) Remove 2nd stage turbine blades adjacent to blades already removed, for a total of four blades per missing damper.

(3) Replacement requirements may overlap. For example, if two adjacent dampers are missing, a total of five 2nd stage turbine blades will require replacement.

(4) Remove paired moment-weight 2nd stage turbine blades 180 degrees opposite. Total quantities listed in above steps will double.

b. Replace 2nd stage turbine blades as determined in step a.

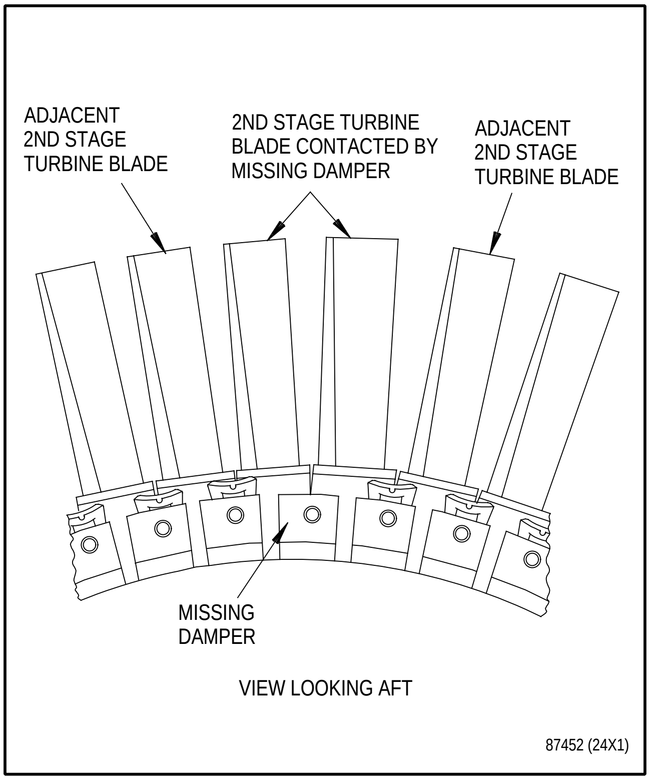


Figure 1. Second Stage Turbine Blade Retaining Plate Assembly - Blade Replacement

c. Replace dampers, bushings, and rivets as follows:

(1) Position retaining plate(5, Figure 2) on PWA 57484 fixture. Ensure rivet ends are located in groove of fixture.

(2) Lightly punch center of rivet head(7) to be removed.

(3) Drill retaining flare of rivet(7) using a No. 31 carbide or cobalt drill bit. Do not damage parent material during drilling operations.

(4) Using a drift drive out remaining portion of rivet.

(5) Remove damper(9) and bushing(8).

(6) Install serviceable bushing(8), damper(9), and new rivet(7).

(7) Flare rivet as shown.

(8) Ensure dampers(9) move freely after riveting, and retaining plate tangs are not bent.

Legend for figure 2

1. Shall be installed in position shown
2. 0.040 inch maximum
3. 0.147 to 0.167 inch diameter
4. Upset to dimension. See index 3.
5. Retaining plate assembly (PN 4070147 typical)
6. This surface shall be flush, or below Surface A. Head may be finished, 72 places.
7. Rivet (PN 637287), 72 required
8. Bushing (PN 2116034), 72 required
9. Damper (PN 4079618), 72 required. Damper shall move freely.
10. Pin, PN 4060785, 2 required (reference only).

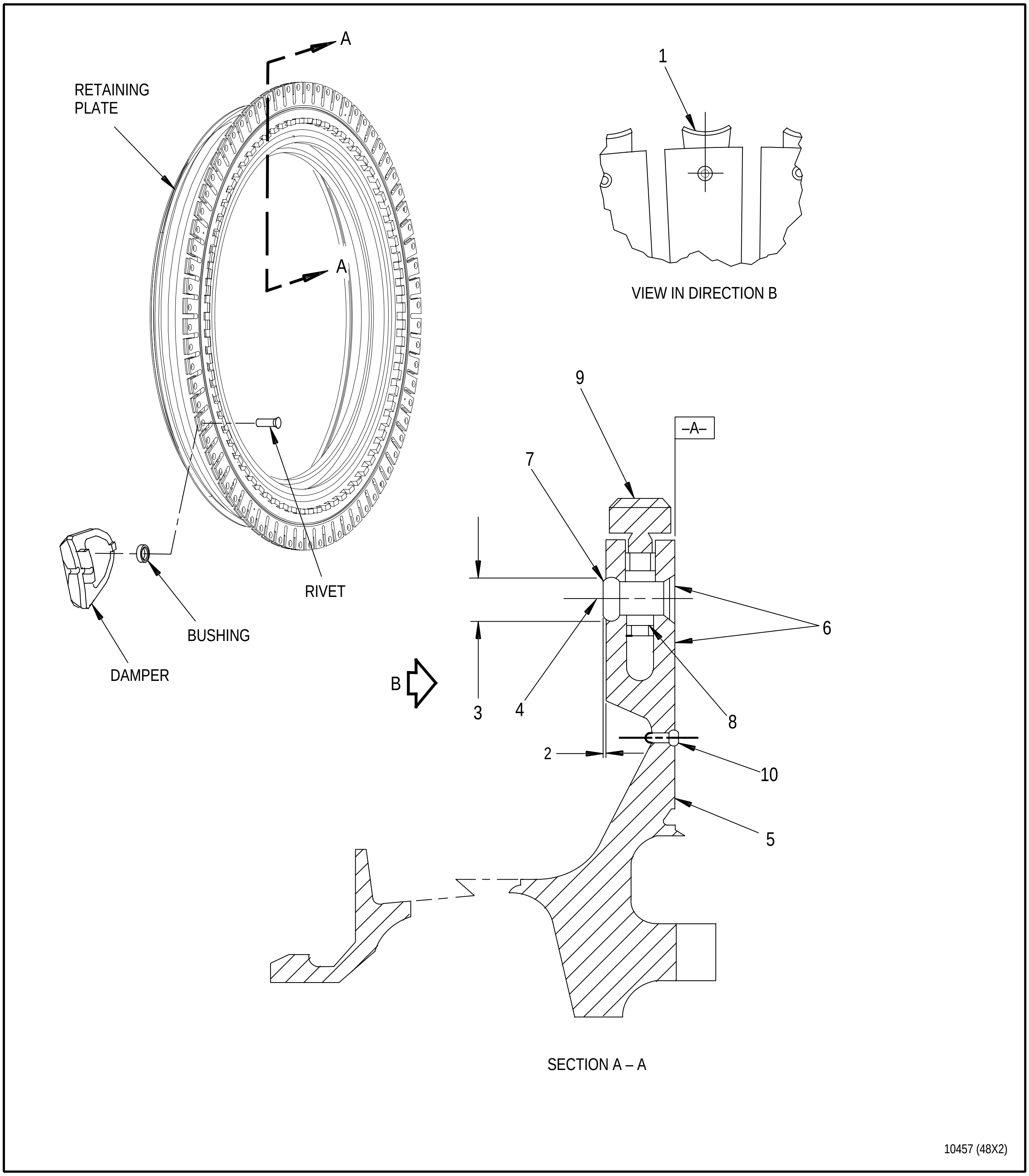


Figure 2. Second Stage Turbine Blade Retaining Plate Assembly - Rivet, Bushing, and Damper Replacement

3. SECOND STAGE TURBINE BLADE RETAINING PLATE - KNIFE-EDGE BLEND REPAIR. (See Figure 3.)

CAUTION

Attempting to straighten knife-edge air seals may damage part.

NOTE

Knife-edge blending repairs are to be completed after aluminum oxide coating is removed. Coating must be reapplied once blend repair is complete.

a. All damage shall be blended using fine files and stones. Refer to T.O. 2J-F100-53-1, WP 091 00. Remove all pickup and raised metal. Observe following blend limits:

(1) Blending shall be limited to one continuous inch on any one knife-edge or two total inches of noncontinuous blends per knife-edge.

(2) Blending shall be limited to three total inches of noncontinuous blends for all knife-edges.

(3) Noncontinuous blends shall be separated by minimum of one inch of unblended knife-edge. One inch separation required for blends adjacent to bend with displacement from radial center plane greater than 0.010 but less than 0.050 inches.

(4) Maximum blend depth shall be 0.075 inch.

(5) Each blended area shall have 0.500 inch minimum transition radius into unblended material.

(6) Blended areas on two or more knife-edges shall be separated by minimum of one inch of unblended area.

b. Blend shall be smooth and continuous with an aspect ratio (length to depth) equal to 14 to 1 or greater.

c. Surface of all blends shall be as smooth as, or smoother than, adjacent non-grit blasted surfaces.

NOTE

- Knife-edges require eddy current inspection after blend repair.
- Use fluorescent penetrant method until ECI capability is available.

d. Fluorescent penetrant or eddy current inspect knife-edges. Refer to WP 309 00 and T.O. 2J-F100-9, SWP 532 01. No cracks allowed.

Legend for figure 3

1. Example of blended area (all knife-edges)
2. 1.000 inch minimum between blends on same or adjacent knife-edges
3. 0.500 inch minimum radius, all locations
4. 1.000 inch maximum blend length
5. Any amount of blending is reparable as long as final blend meets maximum allowable blend depth (6) and blend length (4) requirements
6. 0.075 inch maximum blend depth. Blends requiring depth greater than this are not serviceable and not reparable.

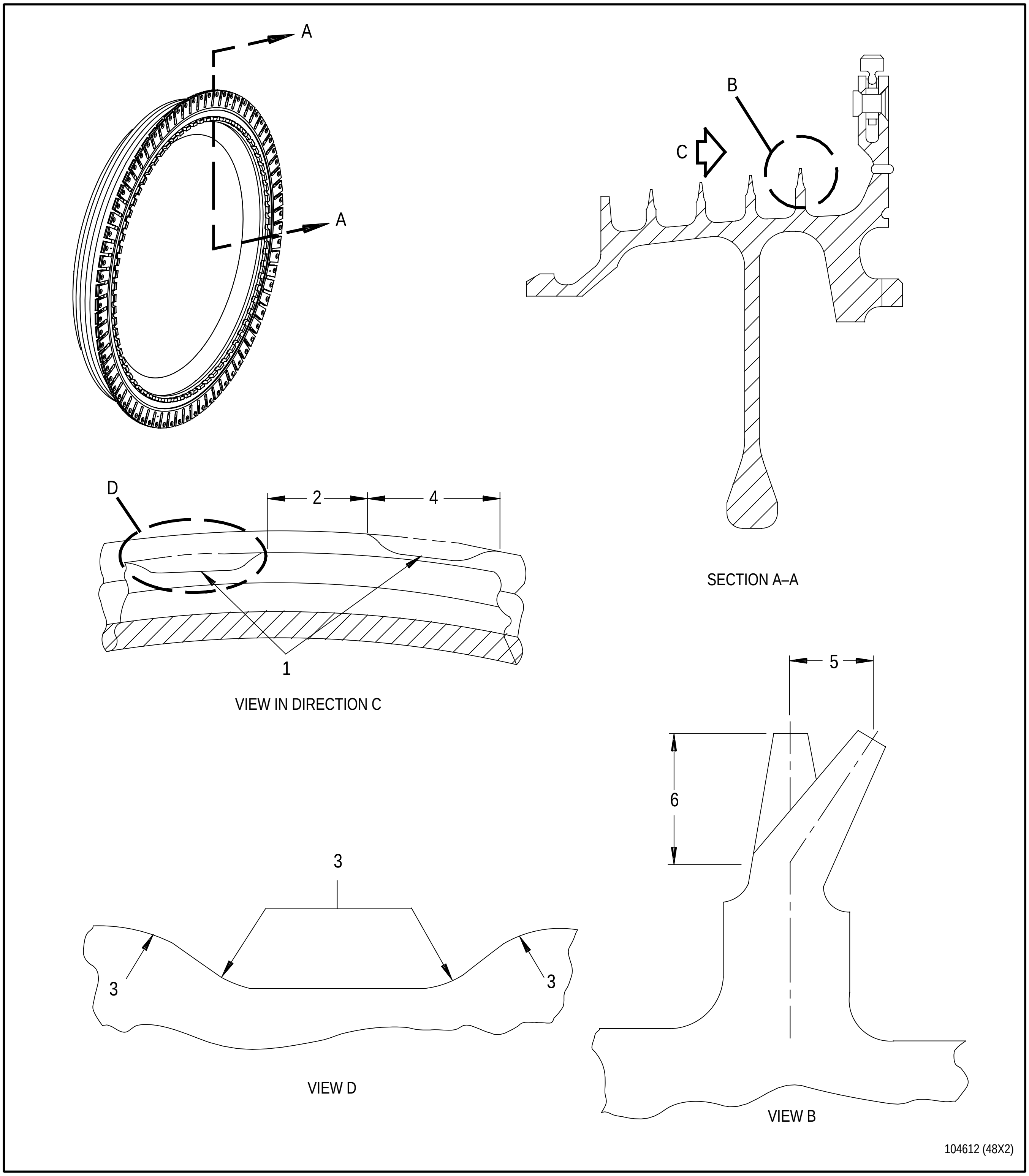


Figure 3. Second Stage Turbine Blade Retaining Plate - Knife-Edge Blend Repair

4. SECOND STAGE TURBINE BLADE RETAINING PLATE - BLEND REPAIR (ALL OVER EXCEPT KNIFE-EDGE SEALS).
(See Figure 4.)

NOTE

Refer to paragraph 3 for knife-edge seal blend repair.

a. Blend all damage using fine files and stones. Refer to T.O. 2J-F100-13-1, WP 091 00. Remove all pickup and raised metal.

b. Maximum allowable blend depth shall be 0.005 inch.

c. Blends shall be smooth and continuous with an aspect ratio (length to depth) equal to 14 to 1 or greater.

d. Surface finish of all blends shall be as smooth as, or smoother than, original finish.

e. Fluorescent penetrant inspect all blend repairs. Refer to T.O. 2-1-111 and T.O. 2J-F100-9, WP 523 00 or 523 01. No cracks allowed.

f. Shot peen per AMS 2430 with 6A intensity, using SAE 170 max cast steel shot, hardness 45 HRC minimum or equivalent. See figure 4 for peening locations.

g. Visually inspect all areas for shot peen entrapment. None allowed.

Legend for figure 4

1. Shot peen per text
2. 0.080 inch
3. 0.235 inch all around
4. Surface AZ. Shot peen coverage required per text except minimum intensity waived
5. No shot peen in this area

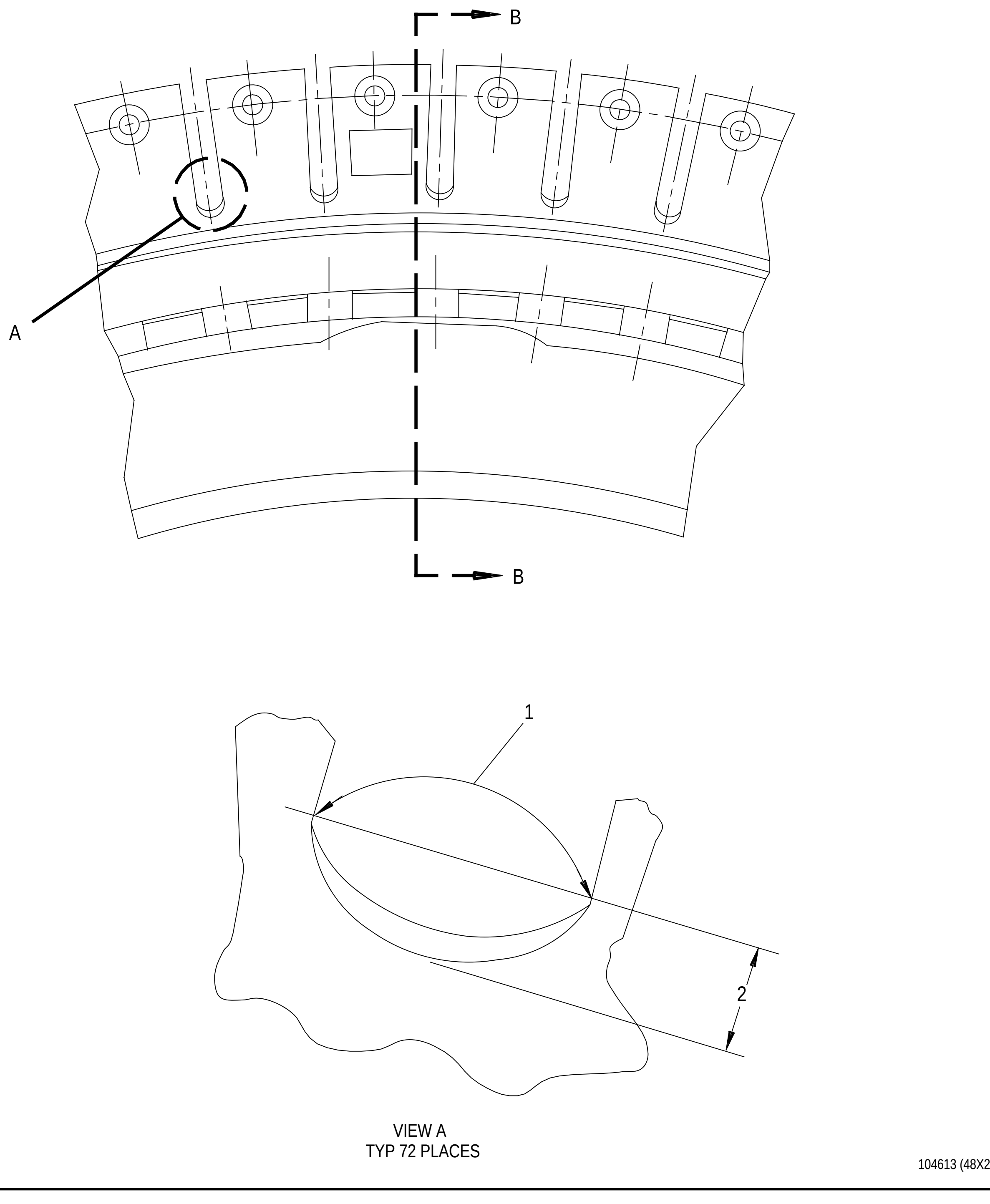


Figure 4. Second Stage Turbine Blade Retaining Plate - Blend Repair (All Over Except Knife-Edge Seals) (Sheet 1 of 2)

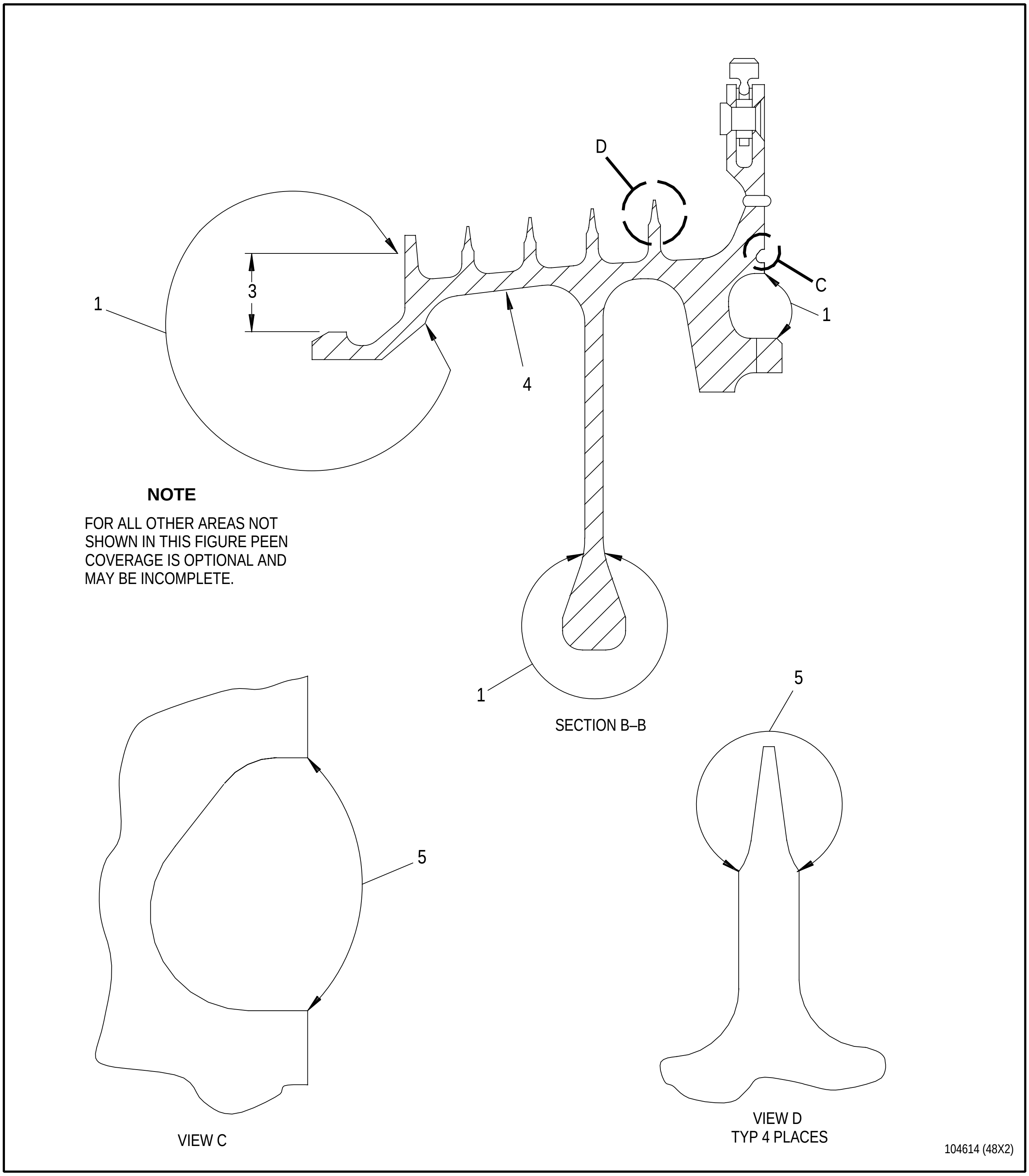


Figure 4. Second Stage Turbine Blade Retaining Plate - Blend Repair (All Over Except Knife-Edge Seals) (Sheet 2 of 2)

5. SECOND STAGE TURBINE BLADE RETAINING PLATE - KNIFE-EDGE COATING REPAIR.

NOTE

Vendor repair procedures listed in Qualified Repair Source List (QRSL) shall be kept current by incorporating all T.O. changes that affect repaired part. If vendor procedure requires revision to comply with T.O. changes, or if vendor desires to revise a procedure, then vendor must notify SA-ALC/LPFE of the need for revision. SA-ALC/LPFE will authorize Pratt & Whitney to coordinate directly with vendor for review and update of procedure/ revision listed in the QRSL.

a. Perform proprietary repair as follows:

(1) Proprietary repairs for following distress modes may be performed only by qualified repair sources identified in the QRSL. Refer to T.O. 2J-F100-53-1, WP 604 00.

- JGDFGZD Worn knife-edge coating

NOTE

- Knife-edges require eddy current inspection once coating has been removed.
- Use fluorescent penetrant until ECI capability is available.

b. Fluorescent penetrant or eddy current inspect knife-edges once coating has been removed. Refer to WP 309 00 and T.O. 2J-F100-9, SWP 532 01. No cracks allowed.

WORK PACKAGE

TECHNICAL PROCEDURES

HUB ASSEMBLY, TURBINE FRONT -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 20

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	27	5 - 7 Added	23	9 - 19 Added	27
3 - 4	3	8	27	20 Blank Added	27

REFERENCE MATERIAL REQUIRED

Title	Number
Standard Maintenance Procedures	T.O. 2-1-111
Nondestruction Inspection	T.O. 2J-F100-9
Introduction and General Information	T.O. 2J-F100-53-1
Inspection, Ultrahigh Supersensitive Fluorescent Penetrant (SPOP)	SWP 071 02
General Repair Procedures - Grinding, Blending, Lapping, Buffing, and Peening	WP 091 00
General Repair Procedures - Compound, Antigalling (PWA 36545) Application (SPOP 748)	SWP 098 07
Qualified Repair Source List (QRSL) Rear Compressor Drive Turbine	WP 604 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ALCOHOL, ISOPROPYL (PMC 9094)	TT-I-735
CLOTH, ABRASIVE CROCUS	P-C-458
COMPOUND, ANTIGALLING (PWA 36545)	ESNALUBE 392
DRY ICE	CARDOX CORP.

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains instructions for repair of the front turbine hub assembly.

2. FRONT TURBINE HUB ASSEMBLY - REPAIR OF WORN DOWEL PIN HOLES.

(See Figure 1.)

a. Clean hub with methyl ethyl keyone, isopropyl alcohol, or acetone.

b. Machine worn hole at location D to next higher value per table 1. See figure 1 Section A-A.

c. Finish machine hole. Refer to T.O. 2-1-111 (SPOP 502).

d. Locally fluorescent penetrant inspect. Refer to T.O. 2J-F100-53-1 SWP 071 02 (SPOP 776).

e. Eddy current inspect. Refer to T.O. 2J-F100-9.

f. Select pin diameter from table 1 to obtain fit of 0.0001 to 0.0012 inch tight.

g. Chill pin using dry ice.

h. Locally induction heat hub pin hole to 350°F (177°C) maximum to provide a 100°F (38°C) minimum temp differential between parts before installation.

i. Use standard drift to install pin. See section B-B.

Table 1. Dowel Pins Requirements

Pin Part Number	Pin Diameter	Hub Diameter E
4075335	0.5321 to 0.5322	0.5310 to 0.5320
4075335P2	0.5341 to 0.5342	0.5330 to 0.5340
4075335P4	0.5361 to 0.5362	0.5350 to 0.5360
4075335P6	0.5381 to 0.5382	0.5370 to 0.5380
4075335P8	0.5401 to 0.5402	0.5390 to 0.5400
4075335P10	0.5421 to 0.5422	0.5410 to 0.5420

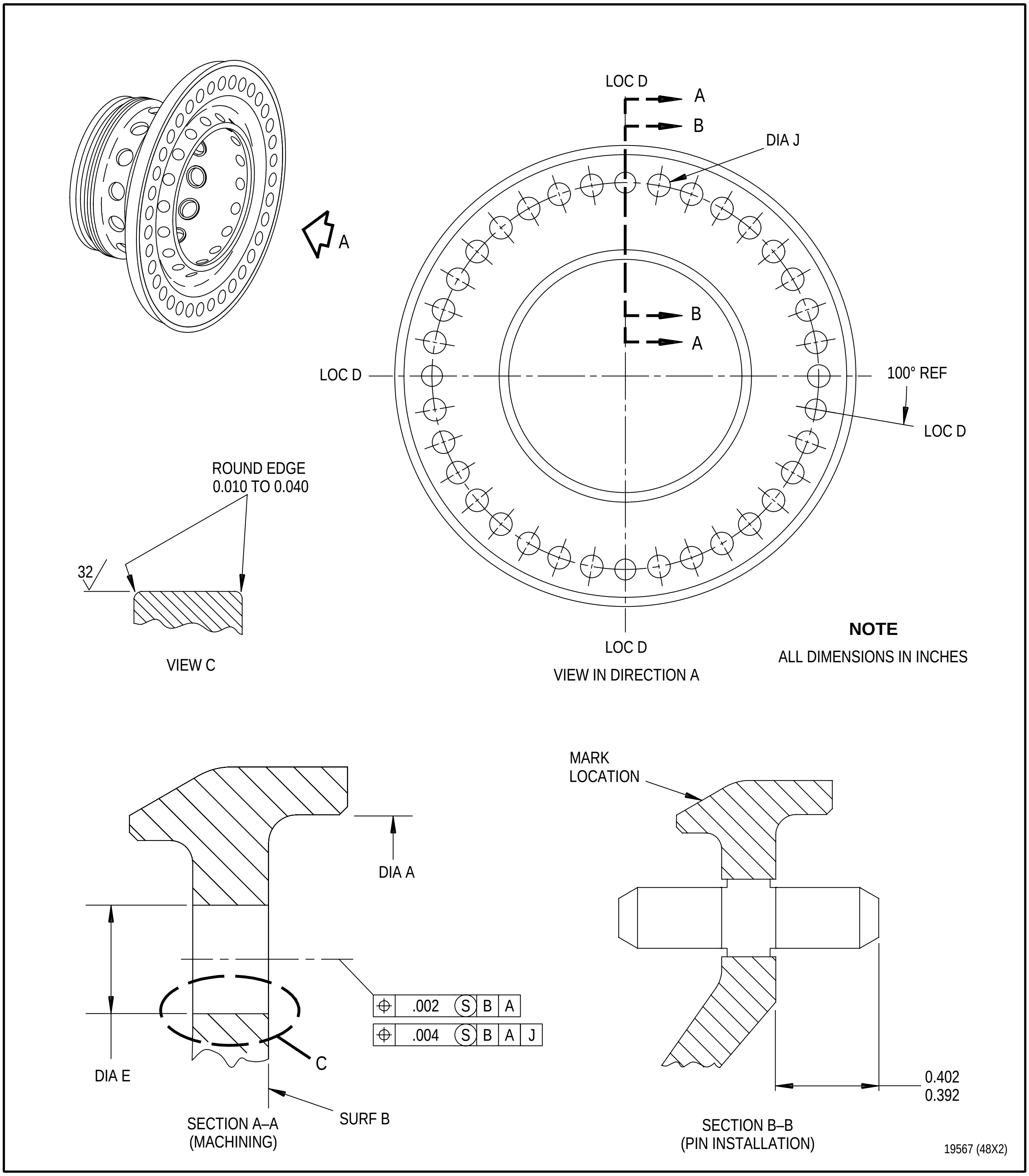


Figure 1. Front Turbine Hub Assembly - Repair of Worn Dowel Pin Holes.

3. FRONT TURBINE HUB ASSEMBLY - KNIFE-EDGE BLEND REPAIR. (See Figure 2.)

CAUTION

Attempting to straighten knife-edge air seals may damage part.

NOTE

Knife-edge blending repairs are to be completed after aluminum oxide coating is removed. Coating must be reapplied once blend repair is complete.

a. All damage shall be blended using fine files and stones. Refer to T.O. 2J-F100-53-1, WP 091 00. Remove all pickup and raised metal. Observe the following blend limits:

(1) Blending shall be limited to one continuous inch on any one knife-edge or two total inches of noncontinuous blends per knife-edge.

(2) Blending shall be limited to four total inches of noncontinuous blends per Group E knife-edges (four total) and three total inches for Group F knife-edges (four total).

(3) Noncontinuous blends shall be separated by minimum of one inch of unblended knife-edge. One inch separation required for blends adjacent to bend with displacement from radial center plane greater than 0.010 but less than 0.050 inches.

(4) Maximum blend depth shall be 0.042 inch.

(5) Each blended area shall have 0.500 inch minimum radius at each end of blend and 0.500 inch minimum transition radius into unblended material.

(6) Blended areas on two or more knife-edges shall be separated by a minimum of one inch of unblended area.

b. Blend shall be smooth and continuous with an aspect ratio (length to depth) equal to 14 to 1 or greater.

c. Surface finish of all blends shall be as smooth as, or smoother than, adjacent non-grit blasted surfaces.

NOTE

Knife-edges are to be eddy current inspected as soon as probe is available.

d. Fluorescent penetrant inspect per T.O. 2-1-111 SPOP 84. Examine indications under white light at 10X magnification. No cracks allowed.

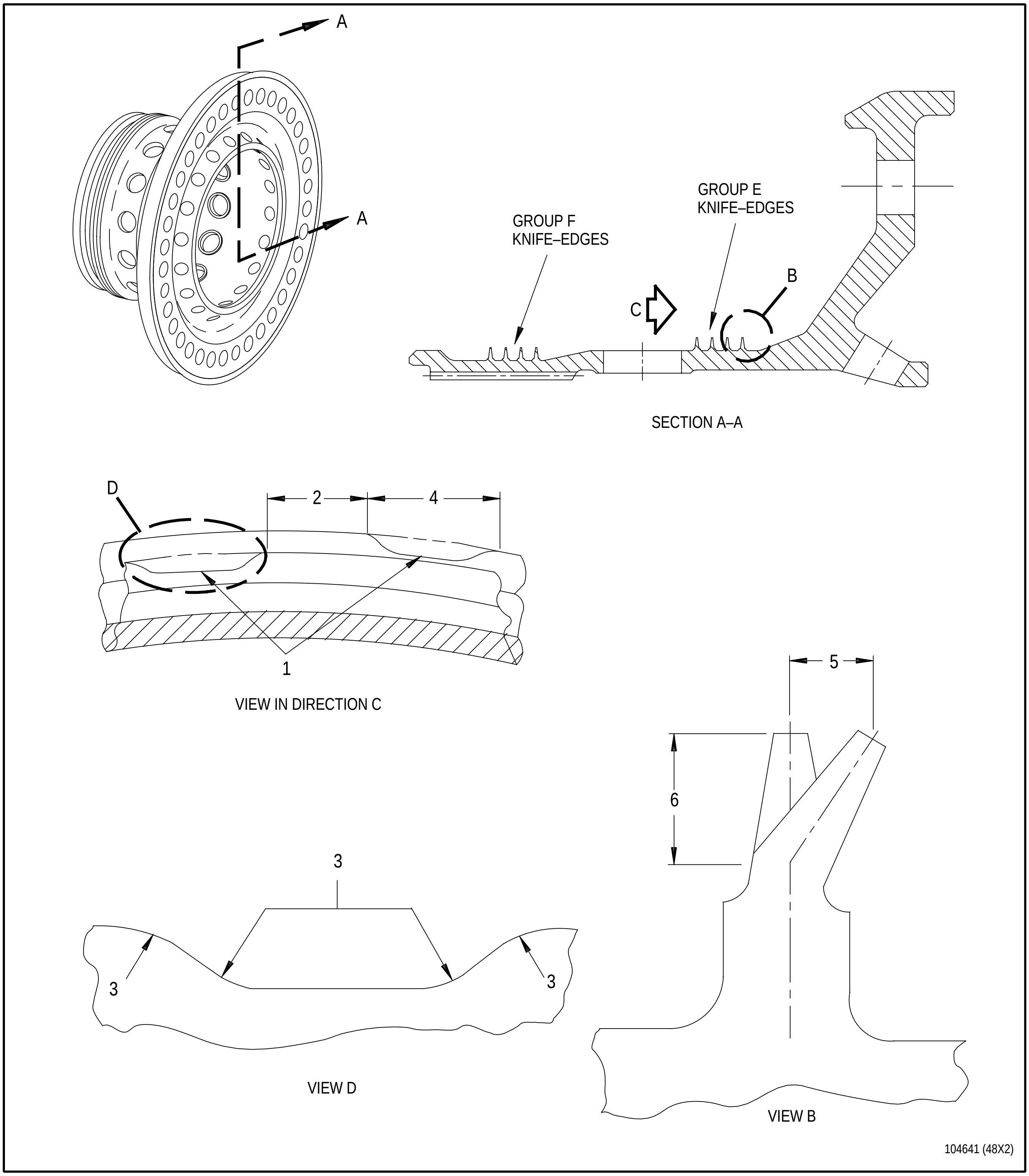


Figure 2. Front Turbine Hub Assembly - Knife-Edge Blend Repair

Legend for figure 2

1. Example of blended area (all knife-edges)
2. 1.000 inch minimum betwen blends on same or adjacent knife edges
3. 0.500 inch minimum radius, all locations
4. 1.000 inch maximum blend length
5. Any amount of blending is reparable as long as final blend meets maximum allowable blend depth (6) and blend length (4) requirements
6. 0.042 inch maximum blend depth. Blends requiring depth greater than this are not serviceable and not reparable

4. FRONT TURBINE HUB ASSEMBLY - KNIFE-EDGE COATING REPAIR.

NOTE

Vendor repair procedures listed in Qualified Repair Source List (QRSL) shall be kept current by incorporating all T.O. changes that affect repaired part. If vendor procedure requires revision to comply with T.O. changes, or if vendor desires to revise procedure, then vendor must notify SA-ALC/LPFE of the need for revision. SA-ALC/LPFE will authorize Pratt & Whitney to coordinate directly with vendor for review and update of procedure/ revision listed in the QRSL.

a. Perform proprietary repair as follows:

(1) Proprietary repairs for following distress modes may be performed only by qualified repair sources identified in the QRSL. Refer to T.O. 2J-F100-53-1, WP 604 00.

- JGDFGZB Worn knife-edge coating

5. ANTIGALLING COMPOUND - APPLICATION.
(See Figure 3.)

a. Apply PWA 36545 antigalling compound per figure 3 and T.O. 2J-F100-53-1, SWP 098 07.

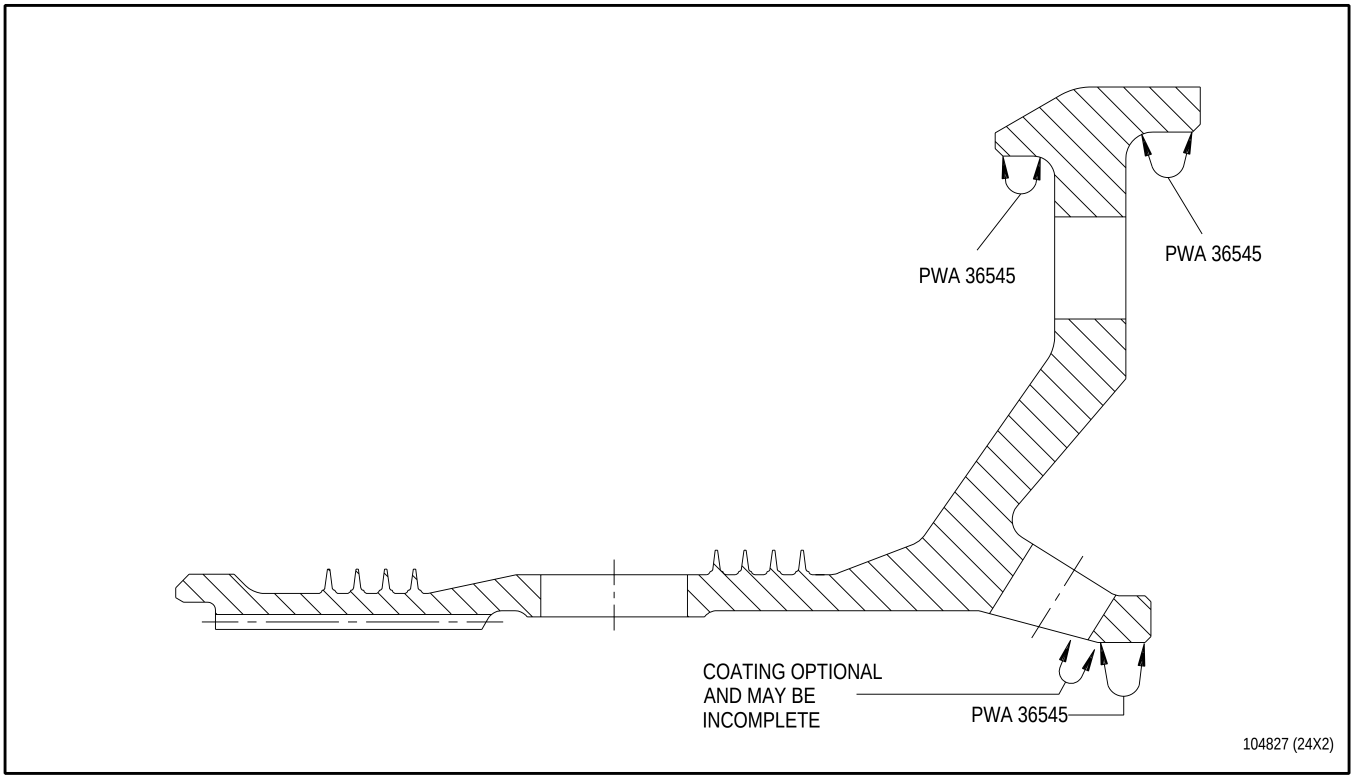


Figure 3. Antigalling Compound - Application

6. FRONT TURBINE HUB ASSEMBLY - REPLACEMENT OF DOWEL PIN.
(See Figure 4 and table 1.)

CAUTION

Failure to use care when removing pin may result in damage to front turbine hub assembly.

a. Remove pin(1, figure 4) by machining. Do not make contact with front turbine hub assembly.

b. Clean front turbine hub assembly with isopropyl alcohol or acetone.

c. Visually and dimensionally inspect hole(2) to requirements of figure 4 and table 1. If necessary repair hole per paragraph 2.

d. Fluorescent penetrant inspect hole per SPOP 82. Inspect per SFPS-M. No cracks allowed. Refer to T.O. 2-1-111.

e. Select pin from table 1 to obtain fit of 0.0001 to 0.0012 inch tight.

f. Chill pin using dry ice.

g. Locally induction heat hub pin hole to 350°F (177°C) maximum to provide a 100°F (38°C) minimum temperature differential between parts prior to installation.

h. Use standard drift to install pin. See section B-B.

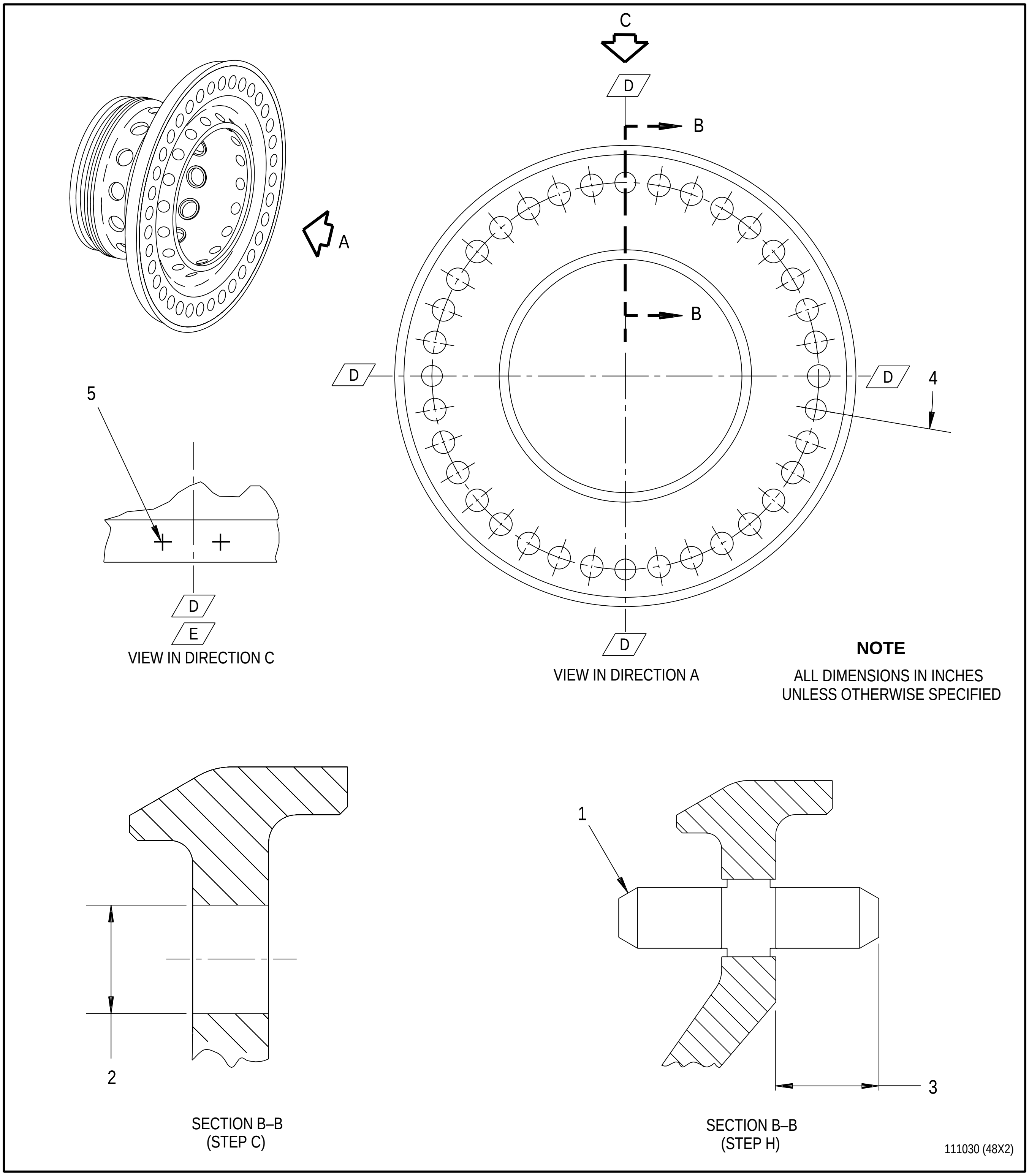


Figure 4. Front Turbine Hub Assembly (Typical PN 4069333) - Replacement of Dowel Pin

Legend for figure 4

1. Dowel pin, 4 places
2. Through hole, 4 places at location D
3. 0.392 to 0.402 inch
4. 110° from location E reference
5. Orientation mark located approximately as shown at location E.

7. FRONT TURBINE HUB ASSEMBLY - PIN BLEND.

a. Blend pins by hand using a fine stone and crocus cloth. Refer to T.O. 2-1-111.

b. Blend minimum amount of material to correct condition.

c. Blend to remove all raised metal and break all sharp edges 0.003 to 0.010 inch.

d. Fluorescent penetrant inspect pins per SPOP 82. Inspect per SFPS-M. No cracks allowed. Refer to T.O. 2-1-111.

8. FRONT TURBINE HUB ASSEMBLY - BLEND FORWARD COOLING HOLE EDGE RADIUS. (See Figure 5.)

NOTE

Cracks found in hole and/or hole edge radius cannot be repaired.

a. Confirm eddy current polishing procedures have been performed.

b. Visually inspect hole edge radius and locate damage using a 10X glass. Blend only round bottom damage as follows:

(1) Mask all knife edges as required to prevent damage from blend operation, except do not use steel mask.

(2) Butterfly blend hole edge radius per SPOP 502. Blend using hand-held air gun is permissible. Refer to T.O. 2-1-111 and figure 5.

(a) Holes may be blended up to 0.055 inch edge radius. See figure 5.

(b) Final surface finish shall be 32AA or better per PWA 362. Refer to T.O. 2-1-111.

(3) Visually and dimensionally inspect hole edge radius and diameter.

(a) Edge radius must be 0.003 to 0.055 inch.

(b) Surface finish must be 32AA or better.

(c) Hole diameter shall not exceed 0.772 inch.

(4) Fluorescent penetrant inspect all polished holes per SPOP 84. Refer to T.O. 2-1-111. Examine indications under white light at 10X magnification. No cracks allowed.

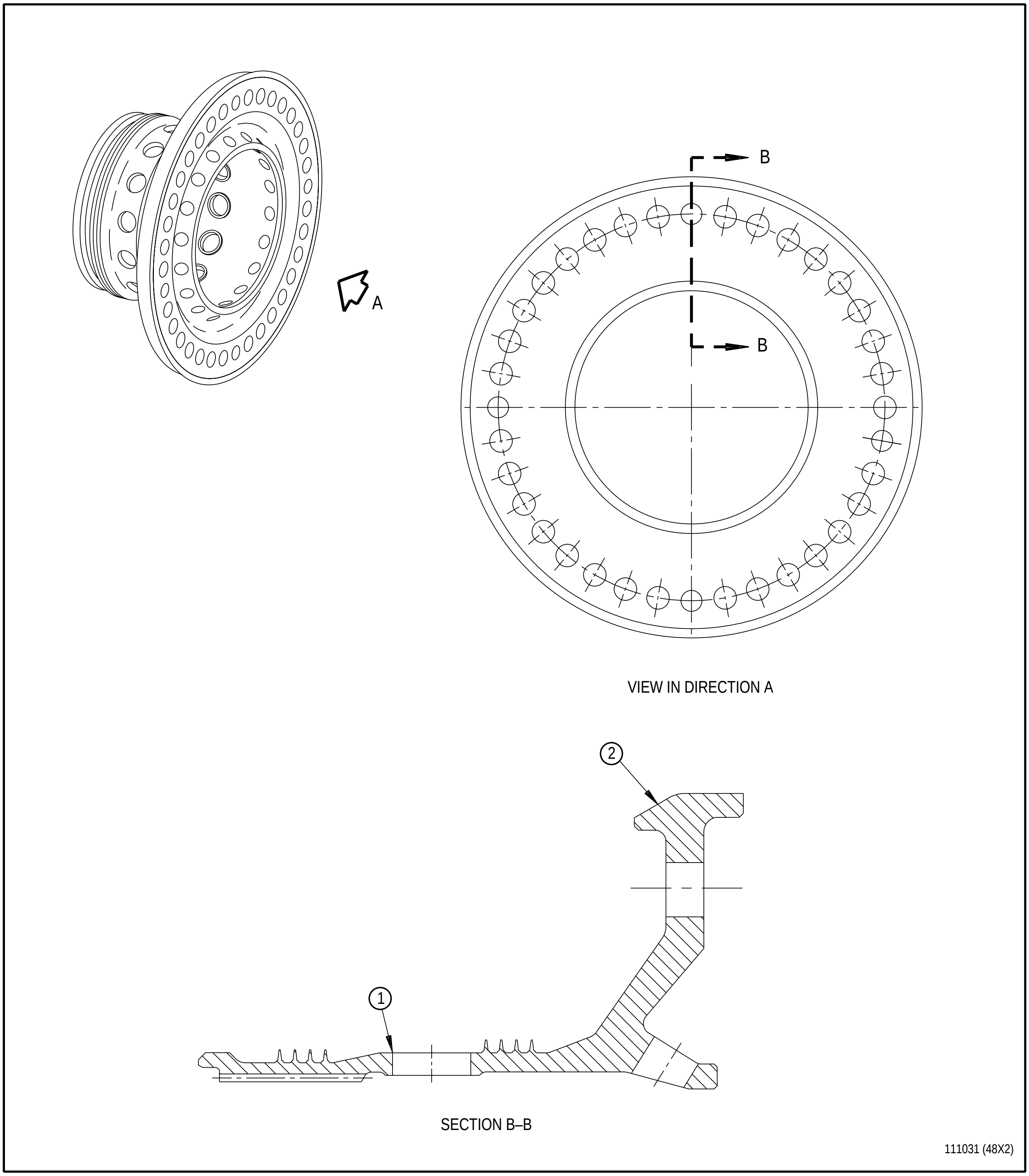
(5) Eddy current inspect hole per WP 314 00.

(a) If eddy current inspection indication remains over limit, and hole edge radius is not greater than 0.055 inch; repeat steps 2 through 5.

(6) Mask all knife edges to prevent damage caused by shotpeen.

(7) Shotpeen hole per paragraph 10.

(8) Apply antigallant per paragraph 11.



1. Round edge 0.003 to 0.055 inch, both sides, with surface finish of 32AA or better.
2. Part marking located in this area.

Figure 5. Front Turbine Hub Assembly - Blend Cooling Hole Radius

9. FRONT TURBINE HUB ASSEMBLY - BLEND FORWARD COOLING HOLE.
(See Figure 6.)

NOTE

- Imperfections determined not to be cracks can be removed per following steps up to 0.772 inch maximum diameter. Specified procedure in this paragraph can remove material up to 0.001 inch beyond hole’s original diameter. If damage does not pass ECI inspection after performing below procedure two times, damage cannot be removed using this paragraph.
- Crack found in holes cannot be repaired using this paragraph.
- Removing damage beyond 0.001 inch may cause hole to become uninspectable for ECI.

a. Confirm eddy current polishing procedures have been performed.

b. Visually inspect hole and locate damage. Blend only round bottom damage.

c. Mask all knife edges as required to prevent damage from blend operation, except do not use steel mask.

d. Butterfly blend hole per SPOP 502. Blend using hand-held air gun is permissible. Refer to T.O. 2-1-111 and figure 6.

e. Visually and dimensionally inspect hole diameter and radius.

(1) Radius must be 0.003 to 0.055 inch.

(2) Surface finish must be 32AA or better per PWA 362. Refer to T.O. 2-1-111.

(3) Do not exceed 0.772 inch diameter.

f. Fluorescent penetrant inspect all polished holes per SPOP 84. Refer to T.O. 2-1-111. Examine indications under white light at 10X magnification. No cracks allowed.

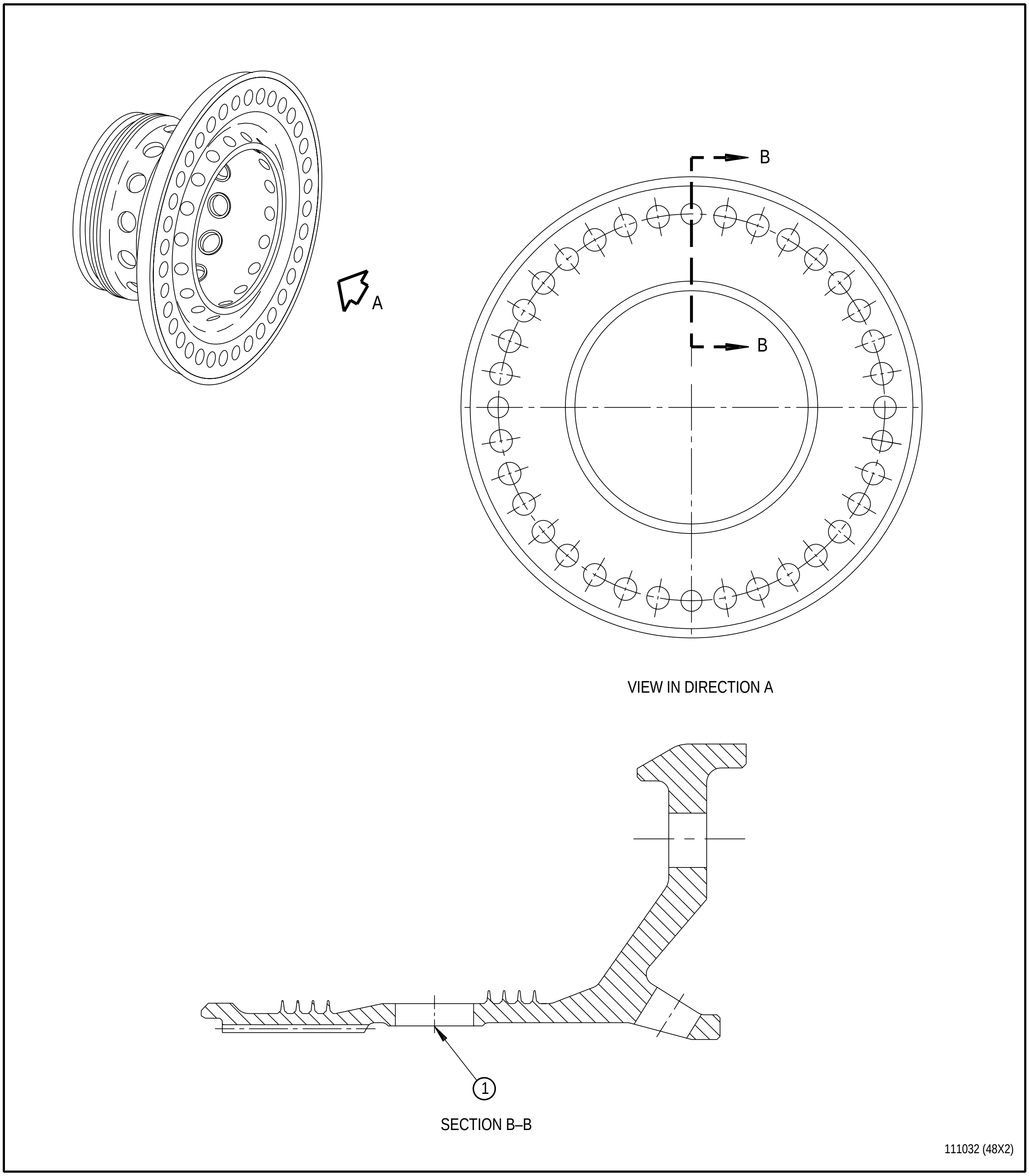
g. Eddy current inspect hole per WP 314 00.

(1) If eddy current inspection indication remains over limit, and hole is not greater than 0.772 inch diameter; repeat steps d through g (two times maximum).

h. Mask all knife edges to prevent damage that can be caused by shotpeen.

i. Shotpeen hole per paragraph E.

j. Apply antigallant per paragraph F.



1. Forward air cooling hole, 14 places

Figure 6. Front Turbine Hub Assembly - Blend Forward Cooling Hole

10. FRONT TURBINE HUB ASSEMBLY - SHOTPEEN OF FORWARD COOLING AIR HOLES. (See Figure 7.)

CAUTION

Failure to use an approved source for this repair may result in a nonserviceable part.

NOTE

This repair is a source demonstration repair. It is recommended reparable parts be sent to an approved source for repair. An approved source list and information on becoming a qualified source can be obtained by contacting the cognizant USAF F100 Engineering Source Authority at the address listed in T.O. 2J-F100-53-1, WP 600 00.

a. Mask coated knife edge air seals and spline as shown in figure 7.

b. Shotpeen hole per SPOP 503 with intensity of 6A using SAE 170 maximum cast steel shot of hardness of 45 HRC minimum or equivalent. Refer to T.O. 2-1-111. No masking and no lines of demarcation permitted, except in marking areas. See figure 7.

c. Visually inspect hole for shotpeen coverage and adjacent knife edges for any unserviceable condition.

d. Remove masking.

e. Visually inspect knife edge coating to ensure chipping or wear has not occurred during de-masking or shotpeen operation.

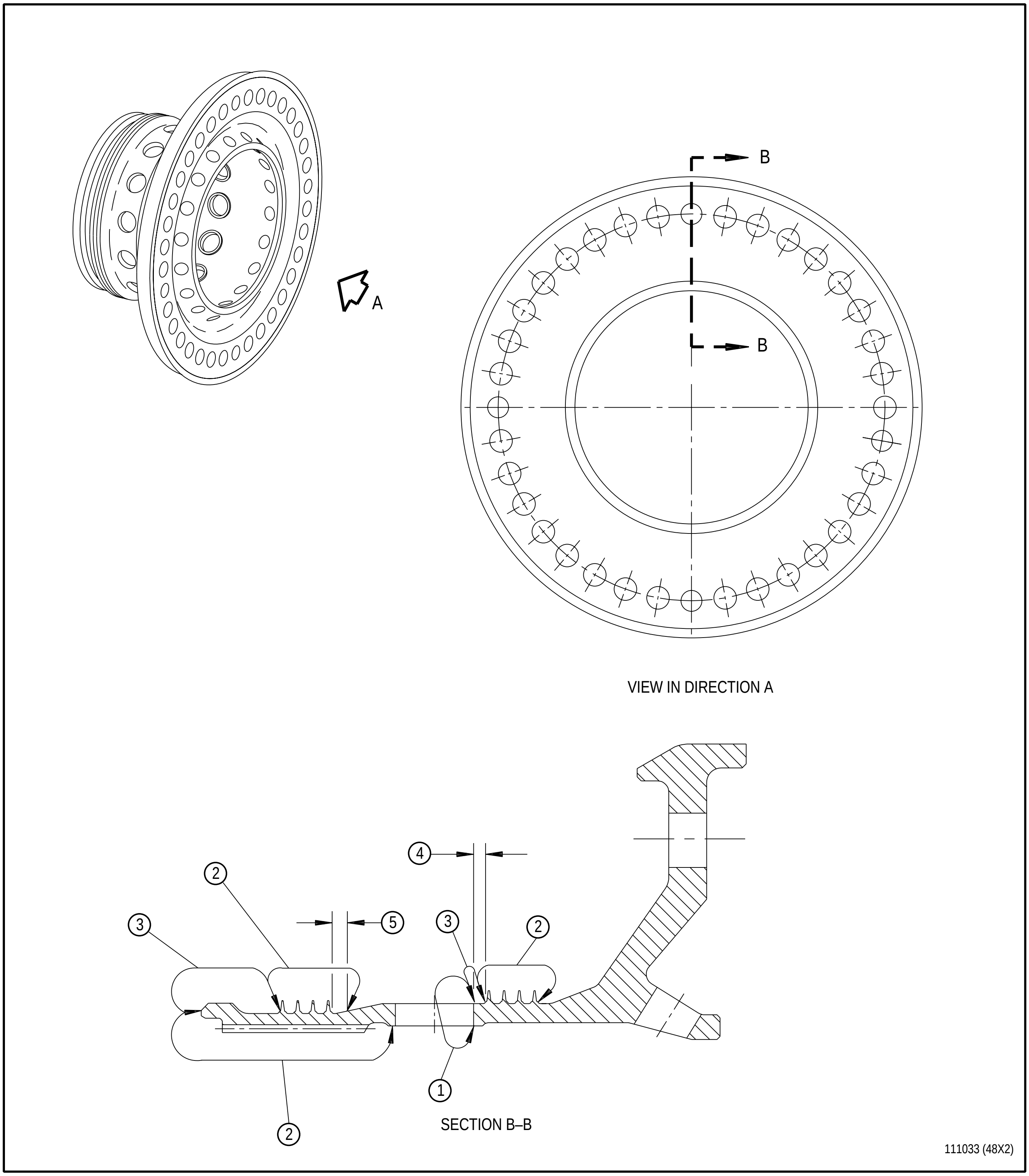


Figure 7. Front Turbine Hub Assembly - Shotpeen of Forward Cooling Hole

Legend for figure 7.

1. Shotpeen area
2. No shotpeening allowed.
3. Shotpeening may be optional and incomplete in this area.
4. 0.050 inch maximum
5. 0.125 inch maximum

11. FRONT TURBINE HUB ASSEMBLY - REMOVAL AND APPLICATION OF PWA 36545 ANTIGALLANT. (See Figure 8.)

a. Remove antigallant per SPOP 734. Refer to T.O. 2-1-111.

b. Apply antigallant per SPOP 748 and figure 8. Refer to T.O. 2-1-111.

Legend for figure 8

1. 0.070 inch maximum
2. Antigallant is optional and may be incomplete over this area.
3. 0.220 inch minimum
4. 0.270 inch minimum
5. Area to be treated with antigallant
6. 0.100 inch maximum

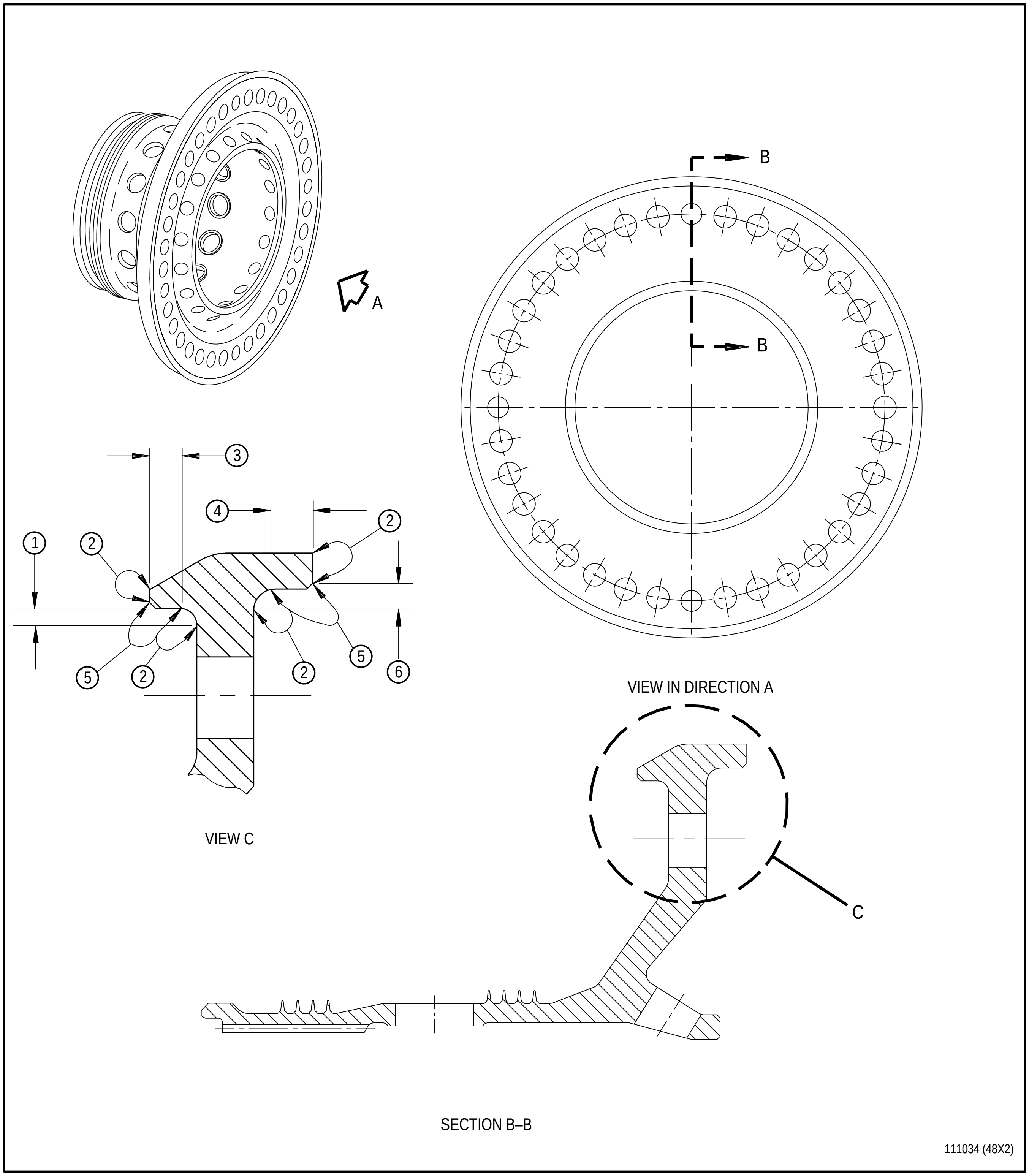


Figure 8. Front Turbine Hub Assembly - Antigallant Application

WORK PACKAGE

TECHNICAL PROCEDURES

DAMPER - TURBINE BLADE RETAINING PLATE -

REPAIR

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 4

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 3	12	4 Blank	12		

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Grinding, Blending, Lapping, Buffing, and Peening	WP 091 00
Nondestructive Inspection	T.O. 2J-F100-9

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

None

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Cloth, abrasive, crocus	P-C-458

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION

a. This work package contains instructions for repair of turbine blade retaining plate damper.

2. TURBINE BLADE RETAINING PLATE DAMPER - BLEND REPAIR

a. Blend damper by hand, using blending stones, fine files or crocus cloth. Refer to T.O. 2J-F100-53-1, WP 091 00.

b. Wall thickness after blending shall be 0.015 inch minimum.

c. All blending shall extend to distance of at least 15 times depth of damage.

d. Surface finish of all blends shall be as smooth as, or smoother than, original finish.

e. Fluorescent penetrant inspect all blend areas. Refer to T.O. 2J-F100-9. No cracks allowed.

f. Hand polish corrosion damage using fine stones and crocus cloth.

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

ASSEMBLY OF SUBASSEMBLIES

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.

This work package introduces the 600 00 through 699 00 series of work packages for the rear compressor drive turbine assembly of subassemblies. The following work packages are included in this series:

WP No.	Title
601 00	Duct and Support Set, Turbine, First Stage, Vanes, Turbine Stator, Second Stage, and Ring Assembly - Air Sealing, Turbine, Second Stage - Assembly
602 00 through 699 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

DUCT AND SUPPORT SET, TURBINE, FIRST STAGE, VANES, TURBINE STATOR, SECOND STAGE, AND RING ASSEMBLY - AIR SEALING, TURBINE, SECOND STAGE -

ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 10

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	24	3 - 4	24	6	24
2A Added	20	5	19	7 Added	24
2B Blank Added	20			8 Blank Added	24

REFERENCE MATERIAL REQUIRED

Title	Number
Illustrated Parts Breakdown -	T.O. 2J-F100-54

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF CORE MODULE FEATURING ’97 ENHANCEMENT PACKAGE, F100-PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
BEESWAX	C-B-191
CRAYON, METAL MARKING (HARD)	COLORBRITE SILVER NO. 2101 OR ANADEL NO. 1936 OR COLOR-TEX SILVER NO. 1843
LOCKWIRE (0.032 INCH DIAMETER)	MS9226-04
LOCKWIRE (0.040 INCH DIAMETER)	MS9226-05

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Seal	4060183	29
Seal	4060186	29
Seal	4084046	29
Seal	4081119	29

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
4	FIRST STAGE TURBINE DUCT AND SUPPORT SET AND SECOND STAGE TURBINE STATOR VANES AND AIR SEALING RING - ASSEMBLY	
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57503

ILLUSTRATED SUPPORT EQUIPMENT

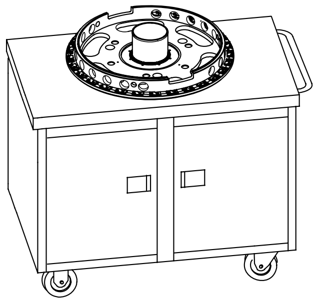


Figure T1. PWA 57503 STAND

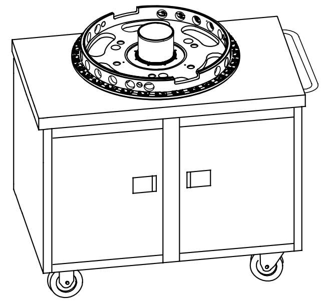


Figure T2. PWA 57765 STAND

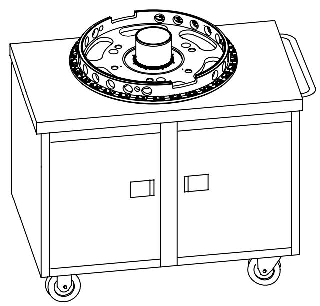


Figure T3. PWA 57830 STAND

1. INTRODUCTION.

a. This work package contains instructions for the assembly of the 1st stage turbine duct and support set, 2nd stage turbine stator vanes and air sealing ring assembly.

2. SECOND STAGE TURBINE STATOR VANES AND SECOND STAGE TURBINE AIR SEALING RING ASSEMBLY - ASSEMBLY.

(See Figure 1.)

CAUTION

Failure to verify PNs may result in configuration mismatch and cause engine damage or failure.

a. Verify correct engine parts to be installed. Refer to T.O. 2J-F100-54.

NOTE

If available, install thermal barrier coated (TBC) vanes at all locations.

b. Install thermal barrier coated (TBC) vanes identified at eight locations per figure 1. Arrange vanes on bench with TBC vanes at locations 1, 4, 5, 7, 8, 26, 27, and 29, per figure 1.

b1. Number vanes on aft face of airfoil using silver crayon.

NOTE

Second stage turbine stator outer and inner seals are two piece bonded assemblies. Details may separate during handling.

c. Ensure seal assemblies are intact. If any 2nd stage turbine stator outer or inner seals are separated, bond details with PWA 36003-1 adhesive using intact seals as models.

d. With vane(4, figure 1) on bench and single tab on inner edge of vane down away from assembler, place seal(2) in recess on inner edge of vane, and place seal(3) open side out, toward assembler in recess on outer edge of vane. Secure in place with beeswax.

e. Place air sealing ring(1) on bench with side having 29 tangs, up.

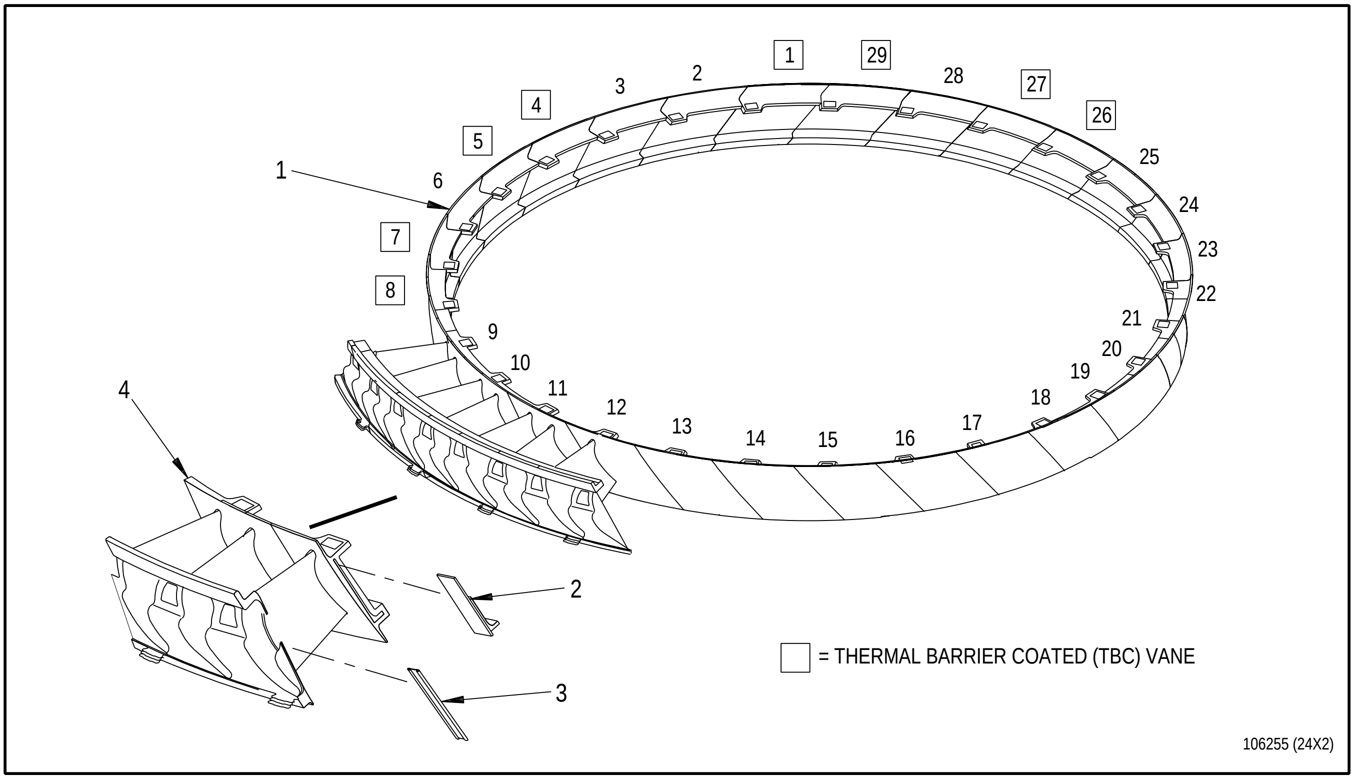
f. Install No. 1 vane with single tab on inner edge of vane, up.

NOTE

For last few vanes, it may be necessary to position installed vanes outward from air sealing ring, and install remaining vanes as unit

g. Starting at first installed vane, and working counterclockwise, install remaining vanes in numerical sequence. Engage tab of waxed in seal at inner edge of vane to air sealing ring.

h. Secure vanes with strand of PN MS9226-04 or MS9226-05 lockwire around vane set outer diameter.



1. Second stage turbine air sealing ring assembly
2. Second stage turbine stator seal assembly
3. Second stage turbine stator seal
4. Second stage turbine stator vane

Figure 1. Second Stage Turbine Stator Vanes and Second Stage Turbine Air Sealing Ring Assembly - Assembly

3. FIRST STAGE TURBINE DUCT AND SUPPORT SET - ASSEMBLY

(See Figure 2.)

NOTE

There are two first stage turbine duct and support set configurations. One set contains 18 segments, comes assembled, and is not addressed in this Work Package. The other set, contains 36 segments, and is assembled as follows (see step a.):

a. Place support on workbench, forward surface down.

b. Install duct segments into support channel aligning segment slot with support pin. Reinstall original segments into corresponding marked locations.

c. Tap duct segment forward using nylon or brass drift and hammer to seat.

d. Ensure all segments are seated.

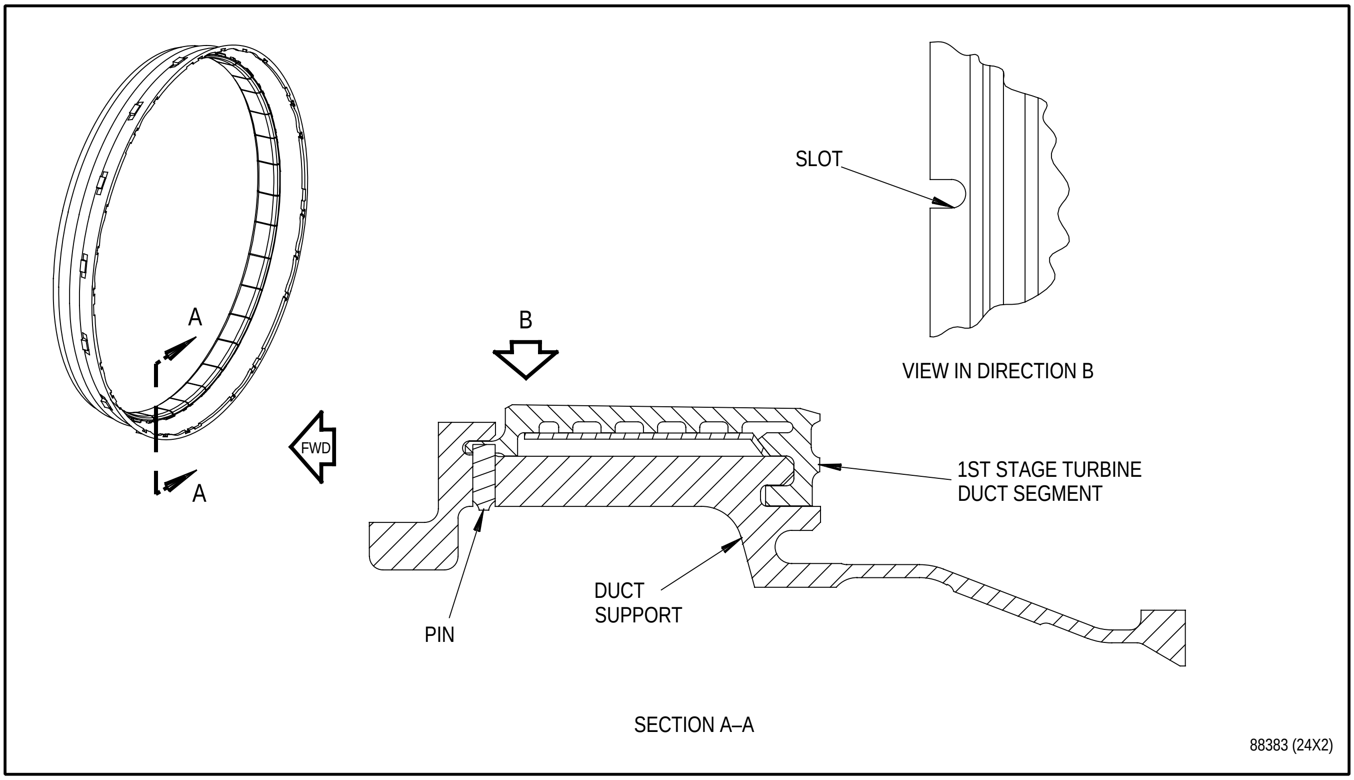


Figure 2. First Stage Turbine Duct and Support Set - Assembly

4. FIRST STAGE TURBINE DUCT AND SUPPORT SET AND SECOND STAGE TURBINE STATOR VANES AND AIR SEALING RING - ASSEMBLY.

(See Figure 3.)

a. Position 1st stage turbine duct and support set(3) on bench, front flange down.

a1. Locate two X marks at dove-tail slots and orient part so that they are at 12 o’clock position.

a2. Locate 2nd stage vane identified as number 1 and orient to 12 o’clock position.

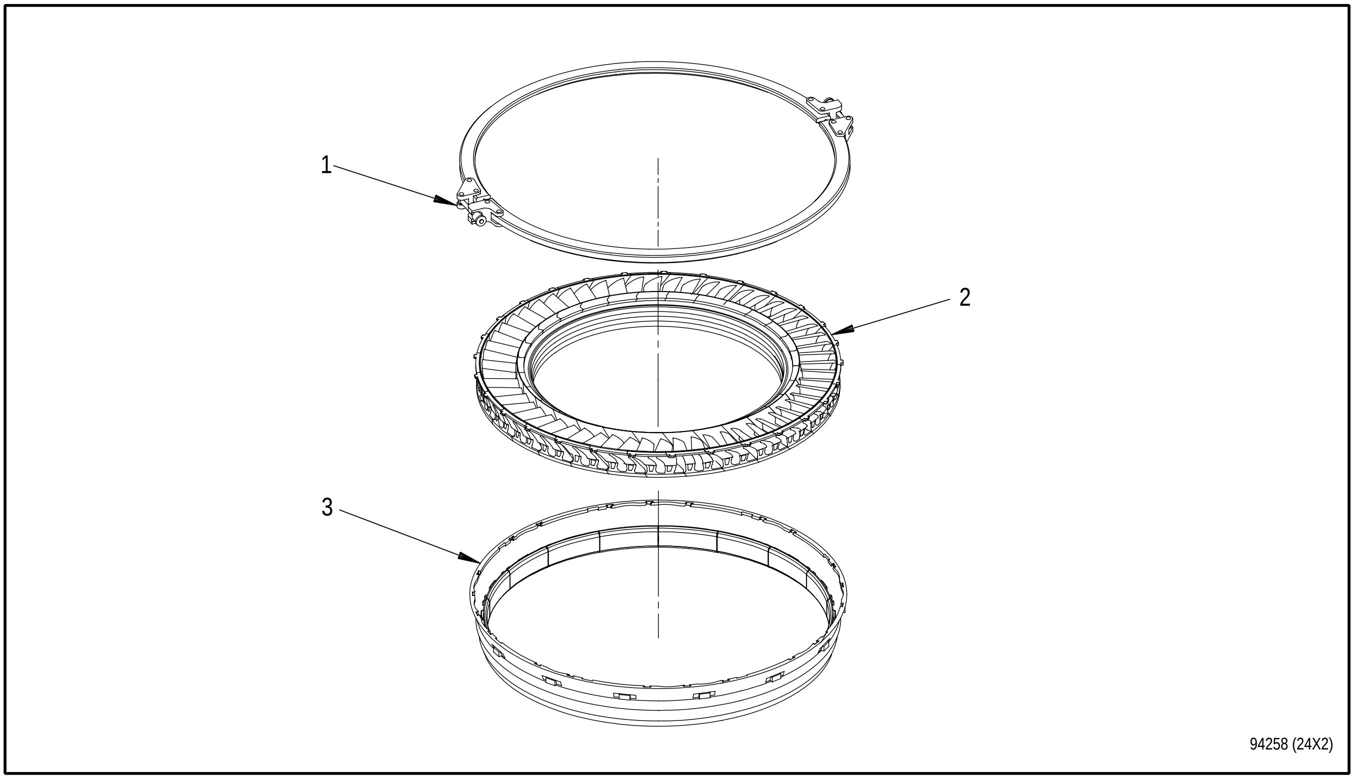
b. With air sealing ring and vanes(2) on bench front face down, grasp ID of air sealing ring with hands and lift assembly into position over duct and support set(3). Lower air sealing ring and vanes into duct and support set(3) aligning tab of vane number 1 with X-marked slot in duct and support set(3).

c. Remove lockwire securing vanes.

d. Tap vane OD lightly with a plastic mallet to start vanes into duct and support set(3).

e. Tap vanes evenly into place using plastic mallet until vanes are fully seated.

f. Install PWA 57830 detail-89 ring clamp(1) onto rear flange of duct and support set(3). Tighten detail-85 knobs to secure detail-89 ring clamp(1) to duct and support set(3).



1. Clamp ring - second stage stator retainer
2. Second stage turbine air sealing ring and stator vanes
3. First stage turbine duct and support set

Figure 3. First Stage Turbine Duct and Support Set and Second Stage Turbine Stator Vanes and Air Sealing Ring - Assembly

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

FINAL ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.

a. This work package introduces the 700 00 through 799 00 series of work packages for the rear compressor drive turbine rotor and stator assembly. The following work packages are included in this series:

WP No.	Title
701 00	Rear Compressor Drive Turbine - Final Assembly
702 00	Rear Compressor Drive Turbine - Dynamic Balancing
703 00 through 799 00	Open

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE -

FINAL ASSEMBLY

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 88

PAGE NO.	CHANGE NO.
1	26
2	25
3	20
4	21
5 - 6B	20
6C Added	20
6D Blank Added	20
7	20
8	21
8A	5
8B	26
9	20
10	2
11 - 12	26
13	19
14 - 14A	20
14B	19
15 - 16	21
16A Added	21
16B	25
16C Added	21
16D Blank Added	21
17	21
18 - 20	20
20A Added	20
20B Blank Added	20
21	2
22 - 22A	20
22B Blank	13
23	13
24	20
25	19
26	3
27	2
28 - 31	20
32	24
33	10
34	20
35	2
36 - 37	20
38	24
39	0
40	25
40A Added	24
40B Blank Added	24
41	2
42 - 44	20
44A Added	19
44B - 44C	20
44D Blank Added	19
45	19
46 - 47	20
48	5
49	2
50 - 51	20
52	19
52A Added	19
52B Blank Added	19
53	19
54	9
54A	20
54B Blank	9
55	20
56	2
57 - 58	20
59	19
60	20
61 - 62 Added	19

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information	T.O. 2J-F100-53-1
General Repair Procedures - Compound Antigalling (PWA 36545) Application (SPOP 748)	SWP 098 07
Rear Compressor Drive Turbine	T.O. 2J-F100-53-8
Rear Compressor Drive Turbine - Disassembly into Subassemblies	WP 011 00
Rear Compressor Drive Turbine - Service Cycle Marking	WP 022 00
Blades, Turbine Rotor, First and Second Stage - Moment-Weight Classification	WP 318 00
Rear Compressor Drive Turbine - Dynamic Balancing	WP 702 00
Illustrated Parts Breakdown	T.O. 2J-F100-54

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF F100-PW-229 CORE MODULE FEATURING "97 ENHANCEMENT PACKAGE" (ECP 96QA053)
2J-F100229(VI)-517	15 SEP 97	D	Reoperation of PN 4069901 or PN 4080301 First Stage Turbine Disk to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA053)
2J-F100229(VI)-518	30 JUN 97	D	Reoperation of PN 4069949 and PN 4080429 First Stage Turbine Air Seal to Incorporate Larger Diameter Fasteners, F100-PW-229 Engine, F-15/F-16 Aircraft. (ECP 96QA053)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
ADHESIVE, EPOXY	PERMABOND 910
BEESWAX	C-B-191
COMPOUND, ANTIGALLING (PWA 36545)	EVERLUBE 382
LOCKWIRE (0.032 INCH DIAMETER)	MS9226-04
LUBRICANT, AIRCRAFT ENGINE	MIL-L-7808 (PWA 521, TYPE I)
PENCIL (CRAYON), SILVER, METAL MARKING (HARD)	COLORBRITE 2101 OR COLOR-TEX 1843 OR ANADEL NO. 1936

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
COLLAR, PIN, RIVET	4061774	8
OR	OR	
NUT - SELF-LOCKING, HEX	4082753-01	
KEY WASHER	4069336	4
PIN RIVET	4069895	8
SEAL, 1ST STAGE TURBINE ROTOR BLADE PLATFORM	4061180	68
SEAL, TURBINE ROTOR	4064308	2
SEAL, TURBINE ROTOR	4064311	1
SEAL, TURBINE ROTOR	4064312	1

APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE, FIRST STAGE TURBINE ROTOR SEAL, AND TURBINE AIR SEAL SPACER - INSTALLATION	
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - - -	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - - -	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - - -	PWA 57503
	HEATER, 1ST STAGE TURBINE DISK RETAINING PLATE SNAP DIAMETER -	PWA 57403 OR
	HEATER, 1ST STAGE TURBINE DISK RETAINING PLATE SNAP DIAMETER -	PWA 57005
	CONTROL, HEATER -	PWA 61685 OR
	CONTROL, HEATER -	PWA 25672
	PUMP, HYDRAULIC, HAND -	PWA 55380
	PLIERS, RING EXPANDER -	PWA 53778
	PRY BAR, HIGH PRESSURE TURBINE - - - - - - - - - - - - - - - -	LM 1009
	HEATER, 1ST STAGE DISK AIR SEAL SNAP DIAMETER - - - -	PWA 57404 OR
	HEATER, 1ST STAGE TURBINE DISK AIR SEAL SNAP DIAMETER -	PWA 57007

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
3	TIERODS - INSTALLATION ONTO FIRST STAGE TURBINE DISK	
	SUPPORT, RETAINING NUTS, TURBINE TIEROD - - - - - - - -	PWA 57908
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57503
	ADAPTER SET, TORQUE (PART OF PWA 57830 STAND) - - - -	PWA 57895 OR
	ADAPTER SET, TORQUE (PART OF PWA 57765 STAND) - - - -	PWA 57504
4	TURBINE FRONT HUB ASSEMBLY - INSTALLATION ONTO FIRST STAGE TURBINE DISK	
	HEATER, 2ND STAGE TURBINE DISK TO HUB - - - - - - - - - -	PWA 57405 OR
	HEATER, 1ST STAGE TURBINE DISK, REAR - - - - - - - - - -	PWA 57026
	CONTROL, HEATER -	PWA 61685 OR
	CONTROL, HEATER -	PWA 25672
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57503
	PUMP, HYDRAULIC, HAND -	PWA 55380
5	SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - INSTALLATION ONTO SECOND STAGE TURBINE DISK	
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY - - - - - - - - - - - - -	PWA 57503
	HEATER, 2ND STAGE TURBINE DISK FRONT OR REAR OUTER SNAP DIAMETER -	PWA 57410 OR
	HEATER, 2ND STAGE TURBINE DISK, FRONT & REAR OUTER SNAP DIAMETER -	PWA 57113
	CONTROL, HEATER -	PWA 61685 OR
	CONTROL, HEATER -	PWA 25672
	PUMP, HYDRAULIC, HAND -	PWA 55380

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
6	FIRST STAGE TURBINE ROTOR BLADES - INSTALLATION	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
8	FIRST STAGE TURBINE DUCT AND SUPPORT SET, SECOND STAGE TURBINE VANES, AND SECOND STAGE TURBINE AIR SEALING RING ASSEMBLY - INSTALLATION	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
9	SECOND STAGE TURBINE DISK AND SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - INSTALLATION	
	HEATER, 2ND STAGE TURBINE DISK TO HUB	PWA 57405 OR
	HEATER, 1ST STAGE TURBINE DISK, REAR	PWA 57026
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	CONTROL, HEATER	PWA 61685 OR
	CONTROL, HEATER	PWA 25672
	PUMP, HYDRAULIC, HAND	PWA 55380
10	TIEROD NUTS - INSTALLATION	
	ADAPTER SET, TORQUE (PART OF PWA 57830 STAND)	PWA 57895 OR
	ADAPTER SET, TORQUE (PART OF PWA 57765 STAND)	PWA 57504

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
12	SECOND STAGE REAR TURBINE BLADE RETAINING PLATE AND TURBINE BLADE RETAINING PLATE RING - INSTALLATION	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	PUMP, HYDRAULIC, HAND	PWA 55380
	PLIERS, RING EXPANDER	PWA 53778
	FIXTURE, LIFT	PWA 57920 OR
	ADAPTER	PWA 57712
13	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION OF FIRST STAGE TURBINE ROTOR BLADES	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	HEATER, 1ST STAGE TURBINE DISK RETAINING PLATE SNAP DIAMETER	PWA 57403 OR
	HEATER, 1ST STAGE TURBINE DISK RETAINING PLATE SNAP DIAMETER	PWA 57005
	CONTROL, HEATER	PWA 61685 OR
	CONTROL, HEATER	PWA 25672
	PUMP, HYDRAULIC, HAND	PWA 55380
	PLIERS, RING EXPANDER	PWA 53778
	PRY BAR, HIGH PRESSURE TURBINE	LM 1009
	HEATER, 1ST STAGE TURBINE DISK AIR SEAL SNAP DIAMETER	PWA 57404 OR
	HEATER, 1ST STAGE TURBINE DISK AIR SEAL SNAP DIAMETER	PWA 57007

APPLICABLE SUPPORT EQUIPMENT (continued)

Paragraph	Function - Tool Nomenclature	Tool Number
14	REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION OF SECOND STAGE TURBINE ROTOR BLADES	
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57830 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57765 OR
	STAND, HPT ASSEMBLY/DISASSEMBLY	PWA 57503
	PLIERS, RING EXPANDER	PWA 53778
	FIXTURE, LIFT	PWA 57920 OR
	ADAPTER	PWA 57712

ILLUSTRATED SUPPORT EQUIPMENT

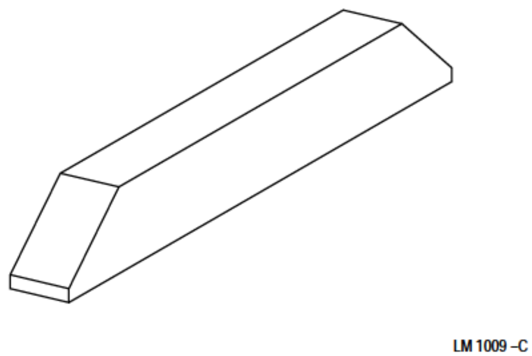


Figure T1. LM 1009 PRY BAR

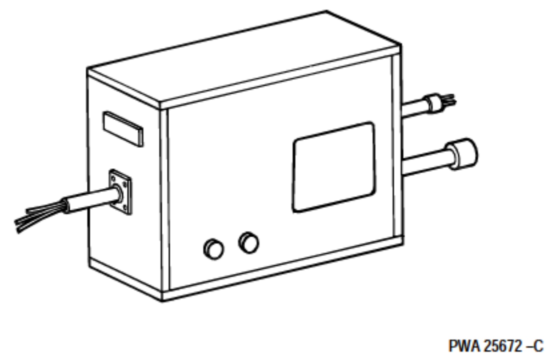


Figure T2. PWA 25672 CONTROL

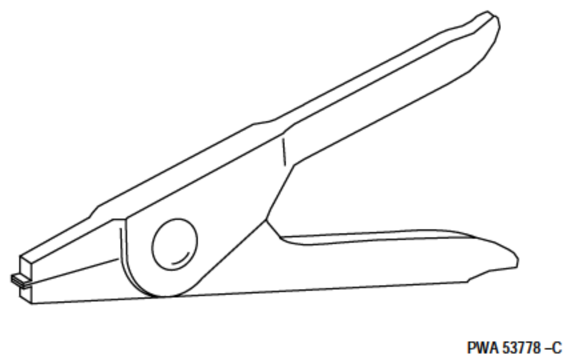


Figure T3. PWA 53778 PLIERS

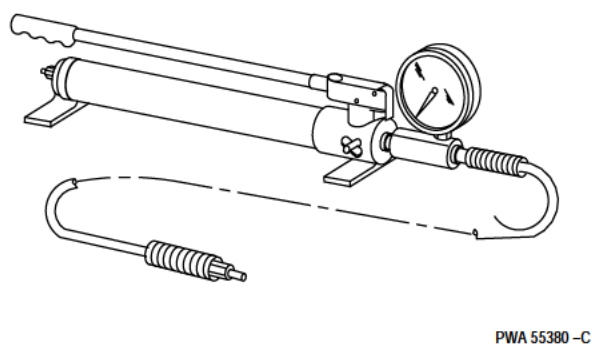


Figure T4. PWA 55380 PUMP

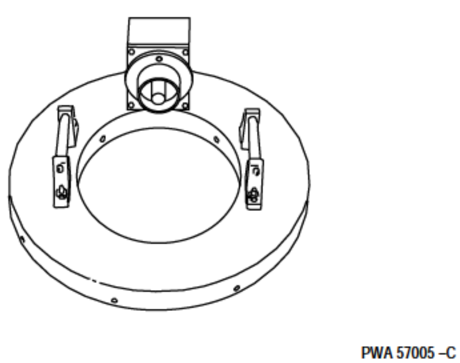


Figure T5. PWA 57005 HEATER

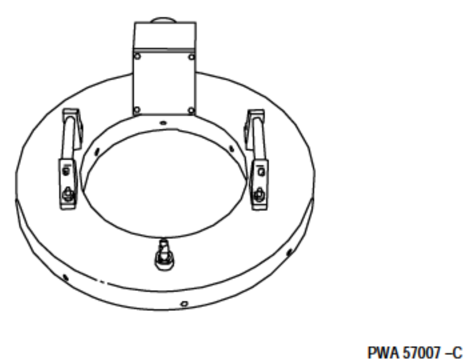
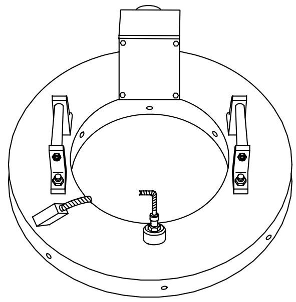


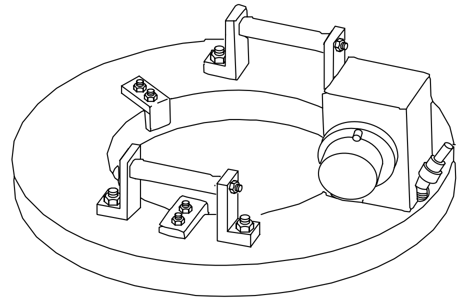
Figure T6. PWA 57007 HEATER

ILLUSTRATED SUPPORT EQUIPMENT (continued)



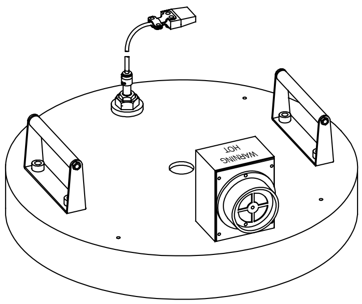
PWA 57026 –C

Figure T7. PWA 57026 HEATER



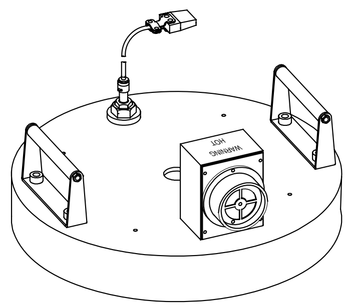
PWA 57113 –C

Figure T8. PWA 57113 HEATER



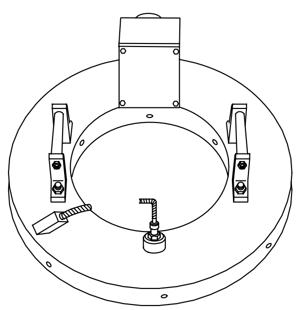
PWA 57403 –C

Figure T9. PWA 57403 HEATER



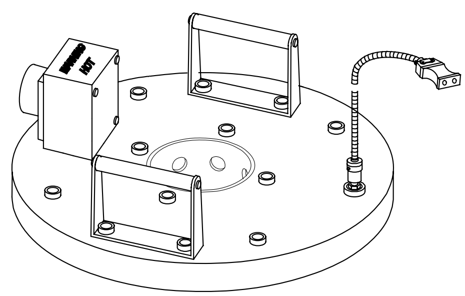
PWA 57404 –C

Figure T10. PWA 57404 HEATER



PWA 57405 –C

Figure T11. PWA 57405 HEATER



PWA 57410 –C

Figure T12. PWA 57410 HEATER

ILLUSTRATED SUPPORT EQUIPMENT (continued)

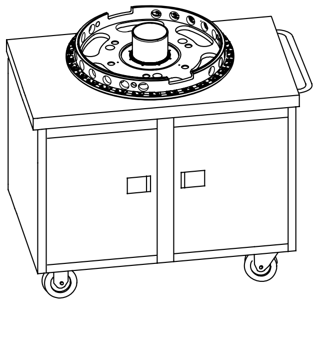


Figure T13. PWA 57503 STAND

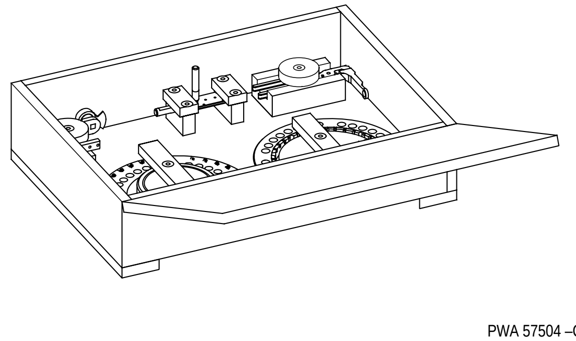


Figure T14. PWA 57504 ADAPTER SET

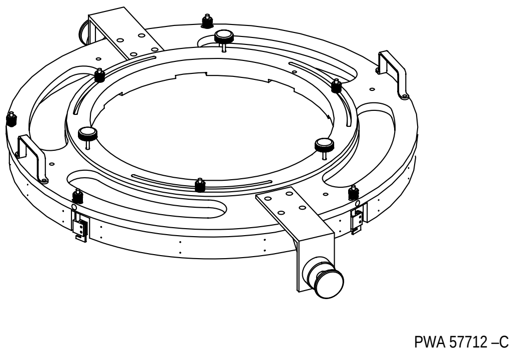


Figure T15. PWA 57712 ADAPTER

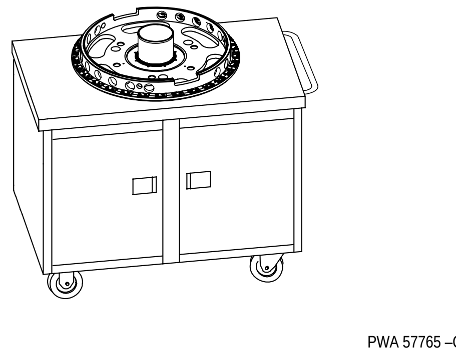


Figure T16. PWA 57765 STAND

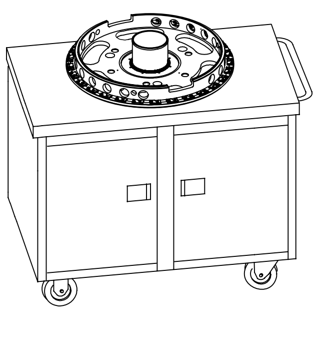


Figure T17. PWA 57830 STAND

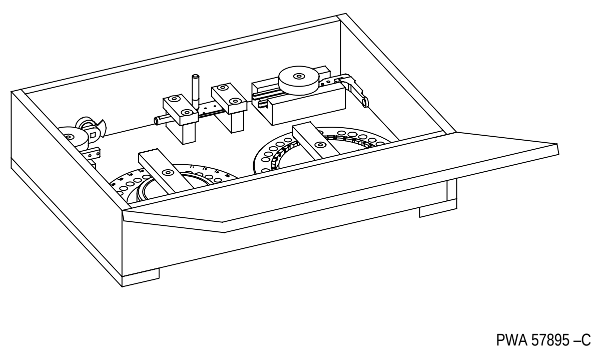


Figure T18. PWA 57895 ADAPTER SET

ILLUSTRATED SUPPORT EQUIPMENT (continued)

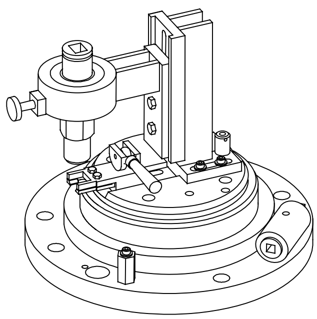


Figure T19. PWA 57908 SUPPORT

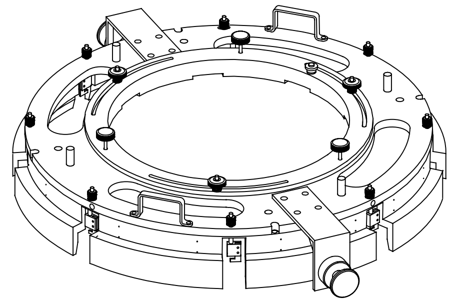


Figure T20. PWA 57920 FIXTURE

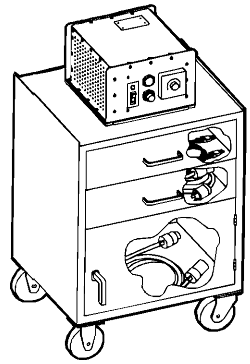


Figure T21. PWA 61685 CONTROL

1. INTRODUCTION.

a. This work package contains instructions for final assembly of the rear compressor drive turbine rotor and stator assembly.

b. Paragraphs 2 through 12 contain instructions for final assembly of the rear compressor drive turbine rotor and stator assembly.

c. Paragraphs 13 and 14 provide instructions for installation of 1st and 2nd stage turbine rotor blades when only 1st or 2nd stage blades have been removed.

2. FIRST STAGE TURBINE BLADE FRONT RETAINING PLATE, FIRST STAGE TURBINE ROTOR SEAL, AND TURBINE AIR SEAL SPACER - INSTALLATION.
(See Figures 1, 2, 4 and 4A.)

a. Install 1st stage turbine blade front retaining plate(6, figure 1) and 1st stage turbine rotor seal(7) as follows:

(1) Install PWA 57830 detail-23 ring(10) into recesses in base of stand(12).

(2) Lower detail-49 adapter(9) onto base of stand(12) large flange down.

(3) Lower 1st stage turbine disk(8), tierod flange down, onto detail-23 ring(10).

(4) Position PWA 57403 heater on retaining plate snap diameter of 1st stage disk(8).

(5) Connect heater to PWA 61685 control and heat snap diameter 350° to 360°F (177° to 182°C) for 20 minutes.

(6) Install rotor seal (white coded ends)(7) into groove of retaining plate(6). Ensure seal end gap is 0.000 to 0.200 inch (see figure 2). Ensure seal ends are located over disk fir tree and that it is properly positioned in retaining plate groove. Hold seal(7) in place with hand-softened beeswax or Permabond 910 adhesive.

Legend for figure 1

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Ring assembly
5. Turbine air seal spacer
6. First stage turbine blade front retaining plate
7. First stage turbine rotor seal
8. First stage turbine disk
9. Adapter
10. Ring
11. Shaft
12. PWA 57830 stand

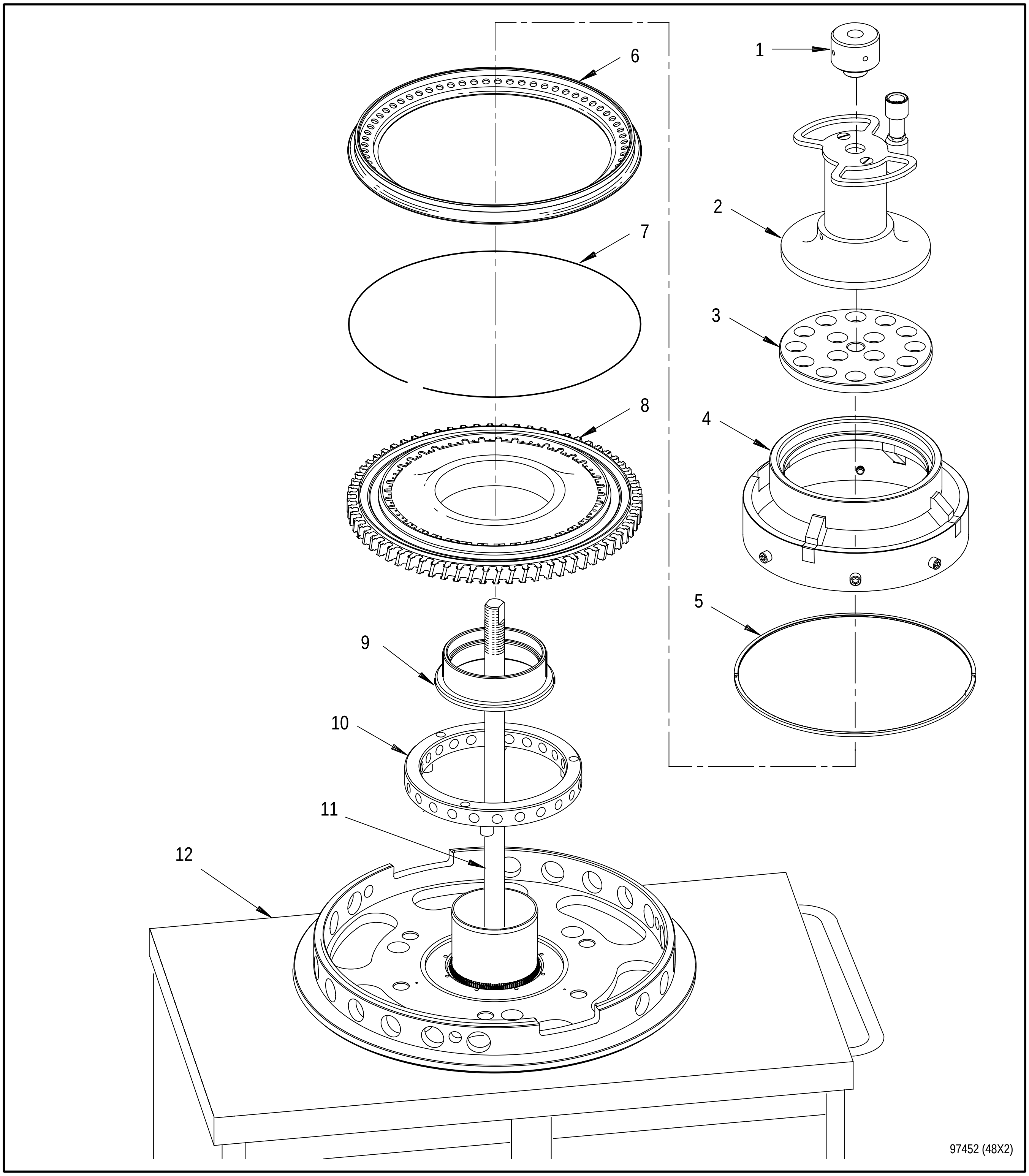


Figure 1. First Stage Turbine Blade Front Retaining Plate - Installation onto First Stage Turbine Disk

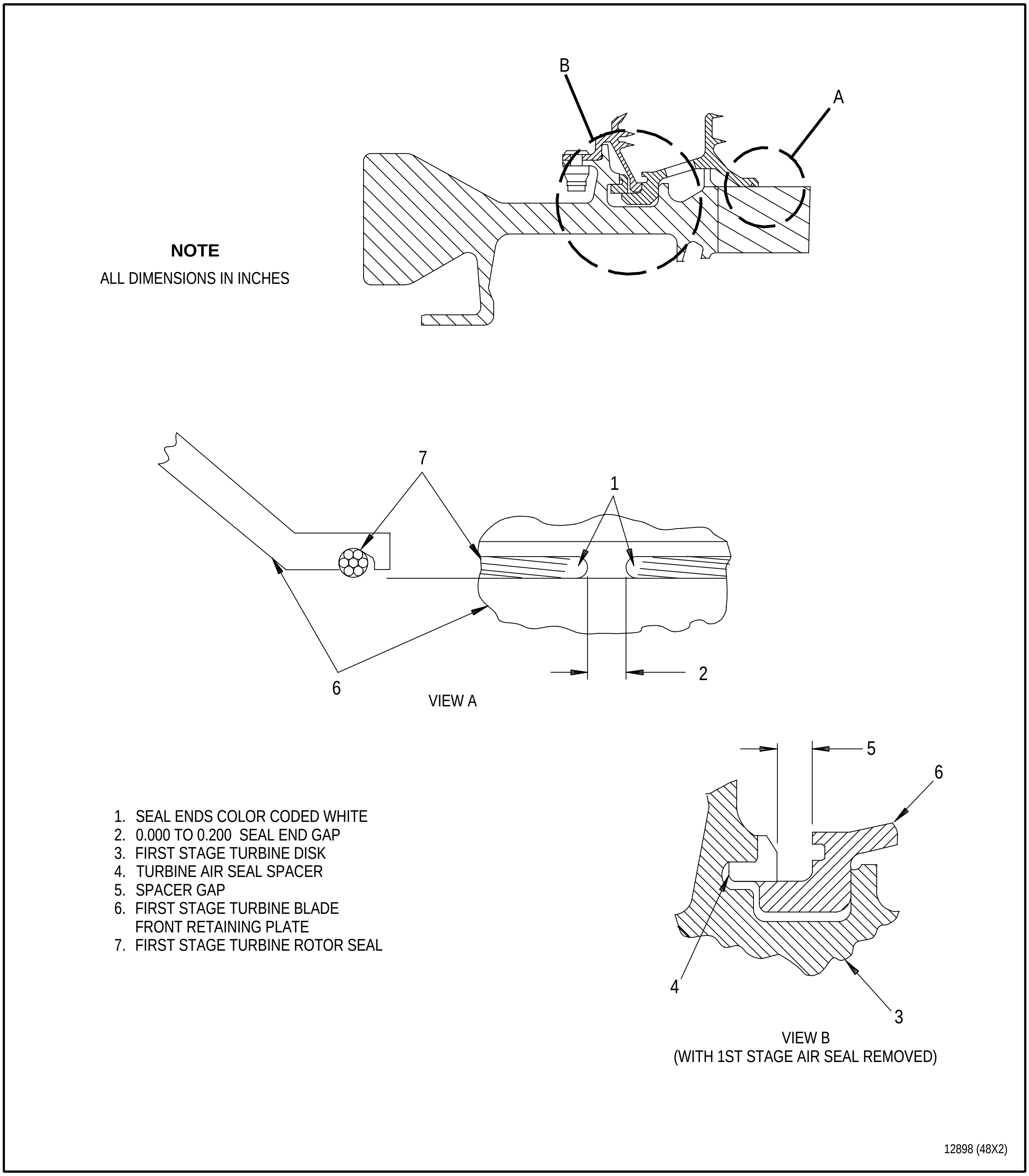


Figure 2. First Stage Turbine Rotor Seal, Blade Retaining Plate and Air Seal Spacer - Installation

NOTE

Retaining plate installation shall be performed rapidly once heater is removed so snap diameter does not lose its heat.

(7) Remove heater from disk.

(8) Ensure mating surfaces are clean and free of foreign material before assembly. Lower retaining plate(6, figure 1), with seal(7) in place, onto 1st stage disk(8).

(9) Lower turbine air seal spacer(5) onto 1st stage disk(8). Situate spacer on disk so that it will not interfere with tool details used to seat retaining plate.

(10) Thread detail-103 shaft(11) into base of stand(12).

(11) Lower detail-28 ring assembly(4) onto retaining plate(6).

(12) Lower detail-102 plate(3) onto detail-28 ring assembly(4).

(13) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(11) until nut is approximately 1/2 inch from hydraulic cylinder assembly(2).

(14) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(15) Work the PWA 55380 pump to seat retaining plate(6) using a minimum pressure of 1000 psig, maximum pressure not to exceed 5000 psig.

(16) With retaining plate depressed, install spacer(5) using PWA 53778 pliers, or equivalent. Use LM 1009 pry bar to ensure spacer is seated.

(17) Release pressure from PWA 55380 pump and verify first stage turbine rotor seal is properly seated.

(18) Verify spacer gap(5, figure 2) by attempting to insert PWA 57830 detail-30 plug gage into gap. If gage can be inserted, gap is acceptable.

(19) Disconnect PWA 55380 pump from hydraulic cylinder assembly(2).

(20) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-28 ring assembly(4).

b. Install 1st stage turbine air seal(6, figure 4) as follows:

(1) Chill air seal in freezer for one hour minimum.

(2) Remove thermocouple from PWA 57404 heater and store on bench. Position PWA 57404 heater on air seal snap diameter of 1st stage turbine disk(8). Install thermocouple in heater ensuring contact with turbine disk.

(3) Connect heater to PWA 61685 control and heat snap diameter at 340° to 350°F (171° to 177°C) for 20 minutes.

NOTE

First stage air seal installation shall be performed rapidly once heater is removed.

(4) Remove heater, ensure mating surfaces are clean and free of foreign material and immediately install air seal(6) onto disk(8), aligning ID flange holes. Install two 0.164 inch rivet pins(5) or two 0.190 inch bolts(5A), depending on configuration, into holes 180 degrees apart to ensure hole alignment is maintained.

CAUTION

Failure to align support equipment may result in bent disk and air seal tangs.

(5) Lower PWA 57830 detail-97 ring assembly(4) onto air seal(6) ID flange, align slots in ring assembly with fasteners.

(6) Lower detail-102 plate(3) onto detail-97 ring assembly(4).

(7) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(9) until nut is approximately 1/2 inch from hydraulic cylinder assembly(2).

Figure 3. Deleted

Legend for figure 4

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Ring assembly
5. Rivet pin (0.164 inch)

5A. Bolt (0.190 inch)

6. First stage turbine air seal
7. Rivet pin collar

7A. Nut (0.164 inch)

7B. Nut (0.190 inch)

8. First stage turbine disk
9. Shaft

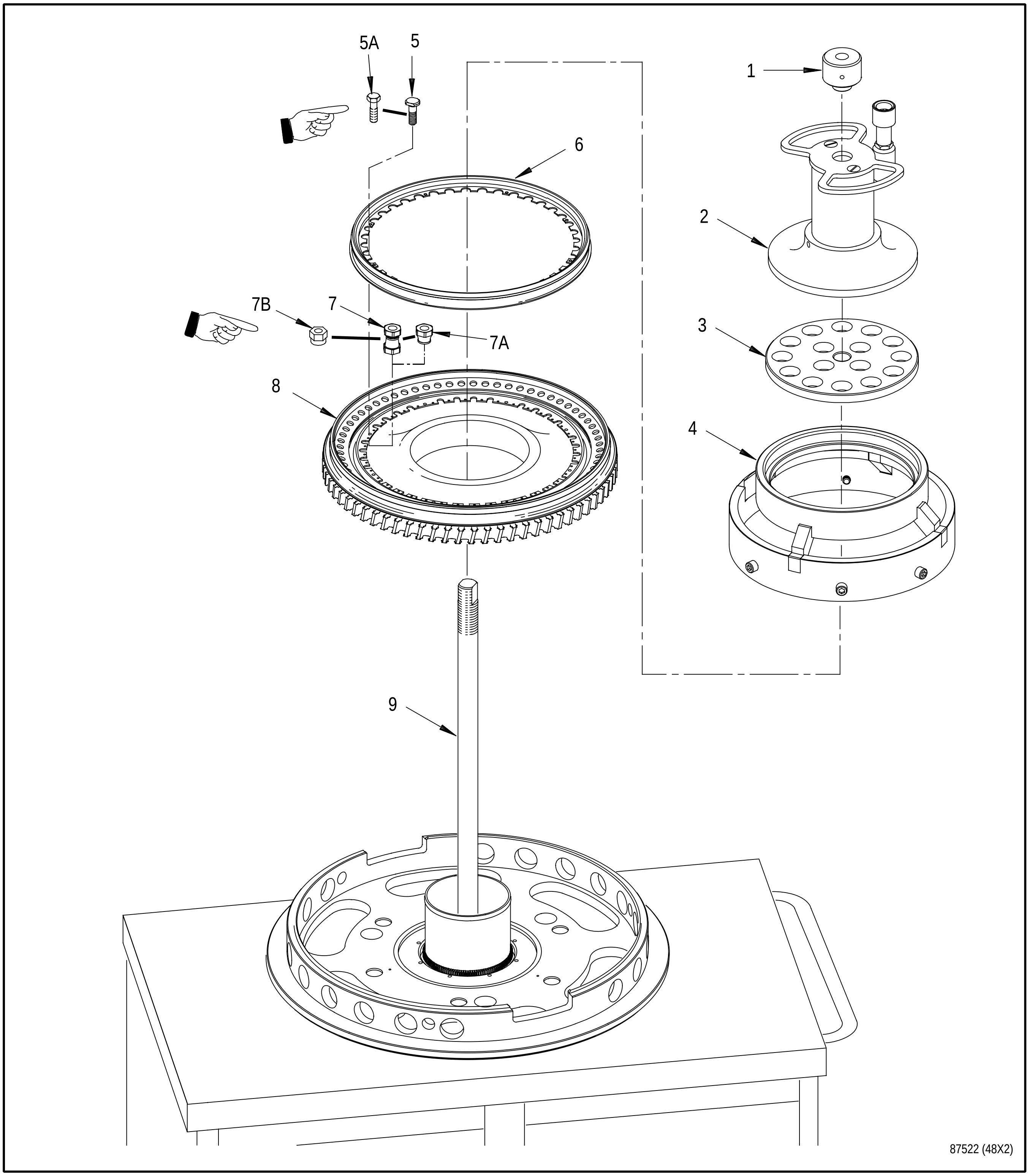


Figure 4. First Stage Turbine Air Seal - Installation

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(9) Work PWA 55380 pump to seat air seal(6) using a minimum pressure of 500 psig, maximum pressure not to exceed 3500 psig.

(10) Allow assembly temperature to normalize before releasing hydraulic pressure.

(11) Release pressure from pump; then disconnect pump from hydraulic cylinder assembly(2).

(12) Remove PWA 57830 detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), detail-97 ring assembly(4), and detail-103 shaft(9).

(13) Ensure that air seal ID flange and disk ID flange are in contact prior to installing fasteners. No gap allowed at OD of air seal scallops between tabs (see figure 4A). If gap exists, remove air seal and repeat steps (1) through 12).

(14) Remove fasteners used to align air seal and disk ID flanges.

CAUTION

Failure to install correct attaching hardware will cause engine damage.

NOTE

Two configurations exist. One uses 0.164 inch rivet pins with either collars or self-locking nuts. The other uses 0.190 inch bolts with self-locking nuts.

(15) For 0.190 inch bolt with self-locking nut configuration, secure air seal to 1st stage turbine disk as follows:

(a) Coat threads of bolts(5A, figure 4) with MIL-L-7808 lubricating oil and install (heads up) through air seal and disk flanges.

(b) Install self-locking nuts(7B) on bolts.

CAUTION

Exceeding torque limits can cause bolt stress or fracture causing severe engine damage.

(c) Torque bolts 48 to 50 pound-inches.

NOTE

- Rivet pins(5, figure 4) may be secured using either pre-sheared collars(7) or self-locking nuts(7A).
- Crowfoot wrench NSN 5120-01-348-7323 (Snap On 5/16 inch Flank Drive crowfoot PN TMRX10) can be used without alteration for installation of rivet pins and nuts.

(16) For 0.164 inch rivet pin with collar or self-locking nut configuration, secure air seal to 1st stage disk as follows:

(a) Verify correct rivet pins are used by checking for two wrenching flats on pin heads. If heads do not have wrench flats, replace with proper parts.

(b) If using collars, pre-shear heads from collars using standard wrenches on two collar wrench flats.

(c) Install rivet pins (heads up) through air seal and disk flanges.

(d) Install pre-sheared collars or self-locking nuts on rivet pins. Verify run-on torque is between 1.5 and 7.0 pound-inches using standard torque wrench on collar or nut while holding rivet pin stationary using flats on rivet pin head. Discard collar or nut if run-on torque is not within 1.5 to 7.0 pound-inch limit.

CAUTION

Exceeding torque limits can cause rivet pin fracture and severe engine damage.

(e) Apply final torque 23 to 27 pound-inches to collars or nuts.

(f) Check for loose assemblies. Replace if not tight.

(17) Remove 1st stage disk from PWA 57830 stand and place on bench front face up.

(18) Remove detail-49 adapter(9, figure 1) and detail-23 ring(10) from base of stand(12).

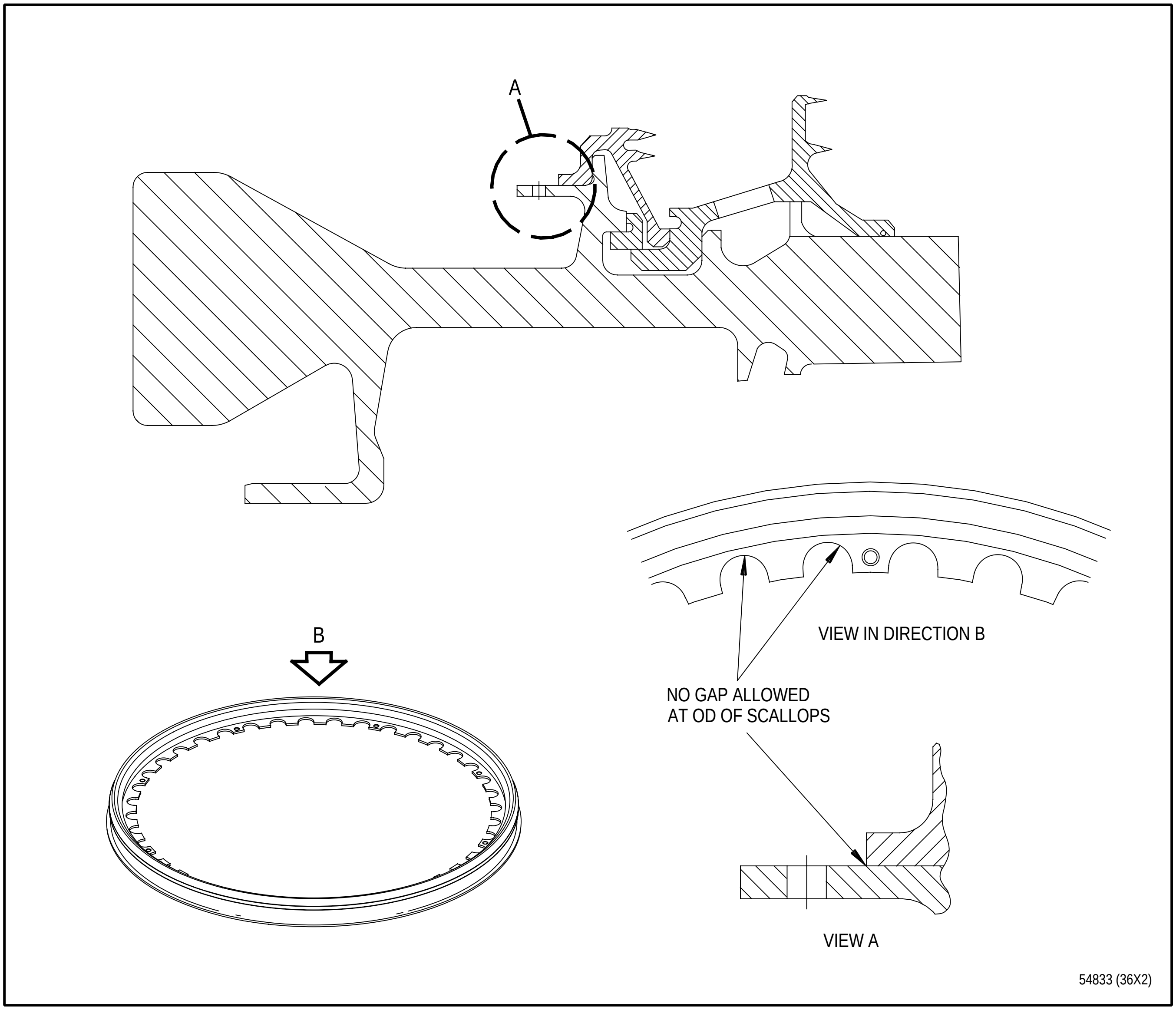


Figure 4A. Rear Compressor Drive Turbine - Air Seal Seating Check

3. TIERODS - INSTALLATION ONTO FIRST STAGE TURBINE DISK.
(See Figures 4B and 5.)

a. Prepare tierod nuts as follows:

(1) Ensure tierod nut threads are coated with baked on PWA 36545-3 antigalling compound before installation. Refer to T.O. 2-1-111.

(2) Prior to reuse only, strip and recoat tierod nut threads with PWA 36545-3 antigalling compound. Nut run on torque shall not exeed five pound-inches.

(3) If necessary, burnish excess PWA 36545-3 antigalling compound from threads using a medium brass brush. Take care not to expose parent metal.

NOTE

Two methods for tierod installation exist. One uses PWA 57908 support per step b. The other uses PW 57895 adapter set, per step c.

b. Install tierods using PWA 57908 support as follows:

(1) Release cam lever(17, figure 4B), block(5), locator(11), arm assembly(3), and post assembly(19) from PWA 57908 support.

(2) Secure PWA 57908 base(12) to work surface. Place locating ring(15), chamfered OD up, onto base and secure with socket head cap screws(13).

(3) Slide locating ring(14), chamfered OD up, over locating ring(15) until locating ring(14) contacts base.

(4) Position 1st stage turbine disk(10), tierod flange up, on previously installed locating ring(14).

(5) Mark location of four larger holes in disk tierod flange with silver pencil, Colorbrite 2101 or equivalent.

(6) Engage flats of block(5) and locator(11) with flats of tierod nut(9).

(7) Secure block and locator together by tightening hex head screws(6).

(8) Actuate cam lever(17) to secure block position.

(9) Insert tierods, tapered end first, through tierod holes and thread into tierod nuts.

(10) Install post assembly(19) and arm assembly(3). Align post and arm with locating hole closest to center of base and insert pin assembly(16). Secure using hex head cap screws.

(11) Loosen thumbscrew(4), and slide block assembly(2) up into arm assembly(3). Secure by tightening thumbscrew(4).

(12) Engage installation adapter(7) with socket(18) and install on tierod.

(13) Position arm assembly(3) to approximate height necessary to install tierod(8). Secure with hex head cap screws.

(14) Loosen thumbscrew(4), and allow block assembly(2) to slide down and engage socket(18) and adapter(7).

(15) Insert torque wrench(1) into top of block assembly(2).

(16) Torque tierod(8) 160 to 170 pound-inches.

(17) Relieve torque from tierod.

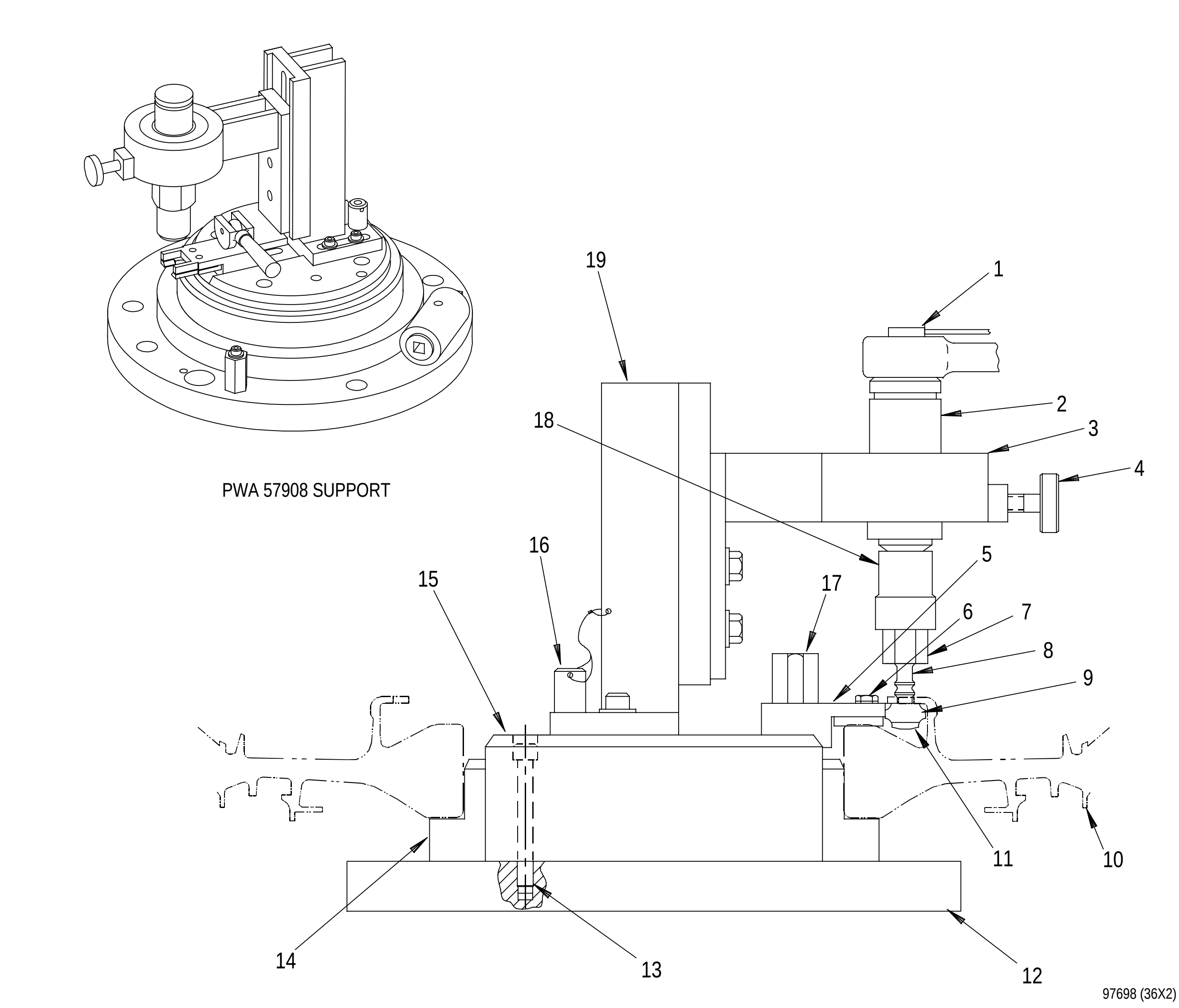
(18) Repeat torquing procedure per steps (16) and (17).

(19) Repeat torquing per step (16).

(20) Verify minimum tierod length (see figure 5). If minimum length is not met, discard nut and repeat steps (6) through (19).

(21) Repeat procedure until all tierods have been installed.

(22) Remove disk and tierods from PWA 57908 support.



1. Torque wrench
2. Block assembly
3. Arm assembly
4. Thumbscrew
5. Block
6. Hex head screw
7. Installation adapter
8. Tierod
9. Tierod nut
10. First stage turbine disk
11. Locator
12. Base
13. Socket head cap screw
14. Locating ring
15. Locating ring
16. Pin assembly
17. Cam lever
18. Socket
19. Post assembly

Figure 4B. Tierods - Installation Using PWA 57908 Support

c. Install tierods using PWA 57895 adapter set as follows:

(1) Lower PWA 57830 detail-19 ring(5, figure 5) onto base of stand(6) so smaller ID of ring is facing up.

(1a) Lower 1st stage turbine disk(4), tierod flange up, onto detail-19 ring(5).

(1b) Mark location of four larger holes in disk tierod flange with silver pencil, Colorbrite 2101 or equivalent.

(2) Install PWA 57895 detail-6 nut holding ring assembly(1) onto 1st stage disk(4) so holes in ring(1) align with tierod holes (smaller holes) in disk tierod flange. Gaps on ring(1) will align with larger marked holes in disk tierod flange.

(3) Remove holding ring(1) and insert tierods(3), tapered end first, through tierod holes and thread tierod nuts(7) onto tierods(3). Tierods shall not contact or damage inside of disk bolt holes during installation and tightening procedures. Do not install tierods(3) in four marked holes in disk tierod flange.

(4) Install segments(8) around tierod nuts(7).

(5) Install holding ring(1) onto disk tierod flange.

(6) Lift up on segments(8) to ensure proper installation and secure segments(8) to holding ring(1) with detail cap screws(2).

(7) Ensure stud driver is bottomed on holding ring before torquing tierods.

(8) Torque tierods(3) 160 to 170 pound-inches.

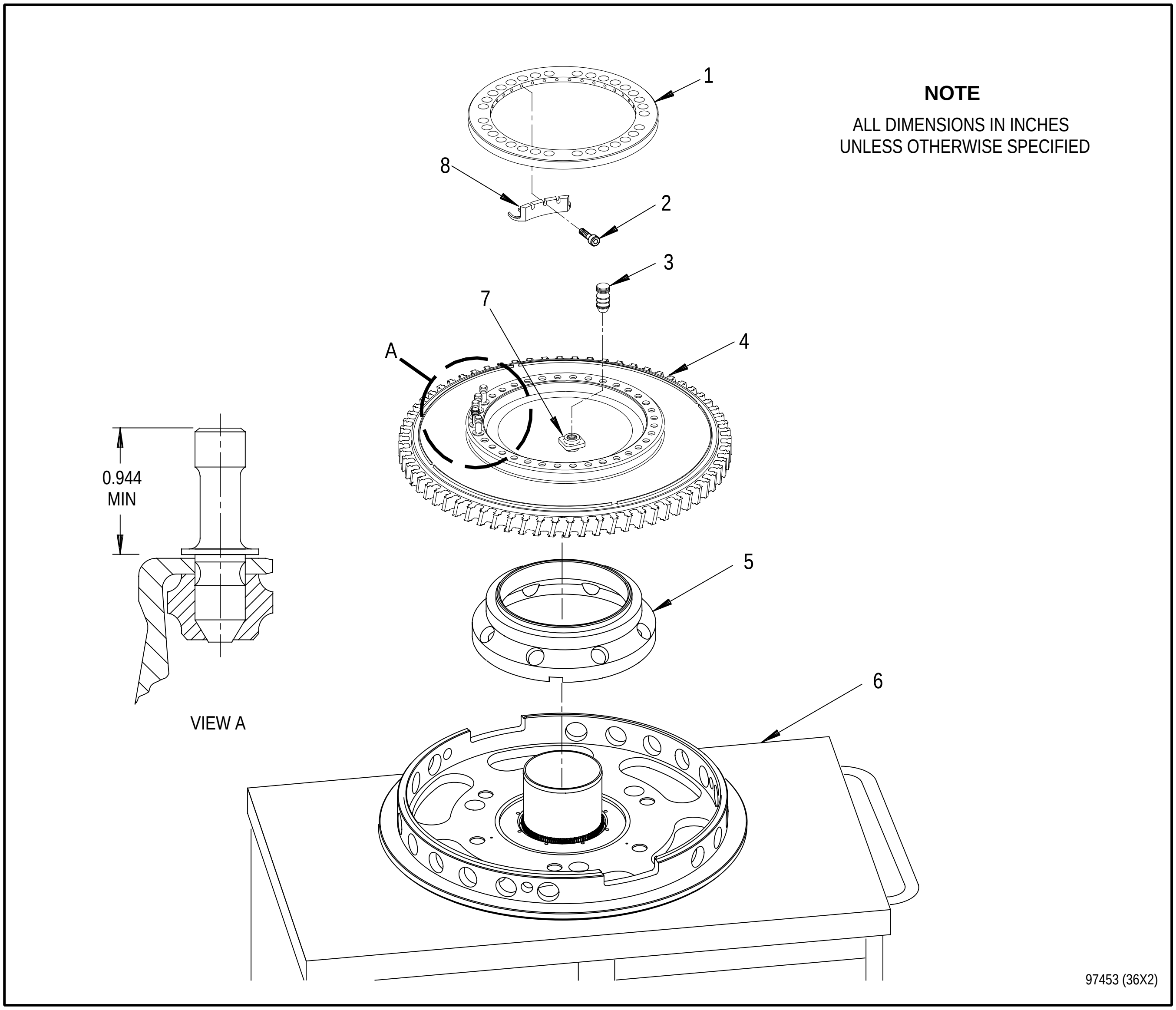
(9) Relieve torque from all tierods.

(10) Repeat Torquing procedures per steps(8) and (9).

(11) Repeat Torquing procedure per step(8). Repeat procedures until all tierods have been torqued.

(12) Verify minimum tierod length (See figure 5). If minimum length is not met, discard tierod nut and repeat steps(5) through(13).

(13) Remove segments(8) and holding ring(1).



1. Holding ring
2. Cap screws
3. Tierods
4. First stage turbine disk
5. Ring
6. PWA 57830 stand
7. Tierod nuts
8. Segments

Figure 5. Tierods - Installation onto First Stage Turbine Disk

4. TURBINE FRONT HUB ASSEMBLY - INSTALLATION ONTO FIRST STAGE TURBINE DISK.
(See figure 5 and Figure 6.)

a. Locate offset dowel pin hole in 1st stage turbine disk(6, figure 6) tierod flange and offset dowel pin in turbine front hub assembly(4) and mark location using Colorbrite No. 2101 silver pencil or equivalent.

b. Place hub(4) rear flange up on an insulated heating surface.

c. Position PWA 57405 heater onto rear flange of hub(4). Connect heater to PWA 61685 control and heat hub at 350° to 400°F (177° to 204°C) for a minimum of 30 minutes.

d. Thread PWA 57830 detail-103 shaft(5) into base of stand(7).

e. Install hub(4) onto 1st stage disk(6) as follows:

NOTE

Hub installation shall be performed rapidly once heater is removed so snap diameter does not lose its heat.

(1) Remove heater, ensure mating surfaces are clean and free of foreign material and install hub(4), front end down, onto 1st stage disk(6), aligning previously marked offset dowel pin in hub with offset dowel pin hole in disk tierod flange. Ensure splines of hub engage splines in center of stand.

(2) Lower detail-100 ring(3), tapered end up, onto rear ID face of hub(4).

(3) Lower hydraulic cylinder assembly(2) onto detail-100 ring(3). Thread detail-9 nut(1) onto detail-103 shaft(5) until nut is approximately 1/2 inch from hydraulic cylinder assembly(2).

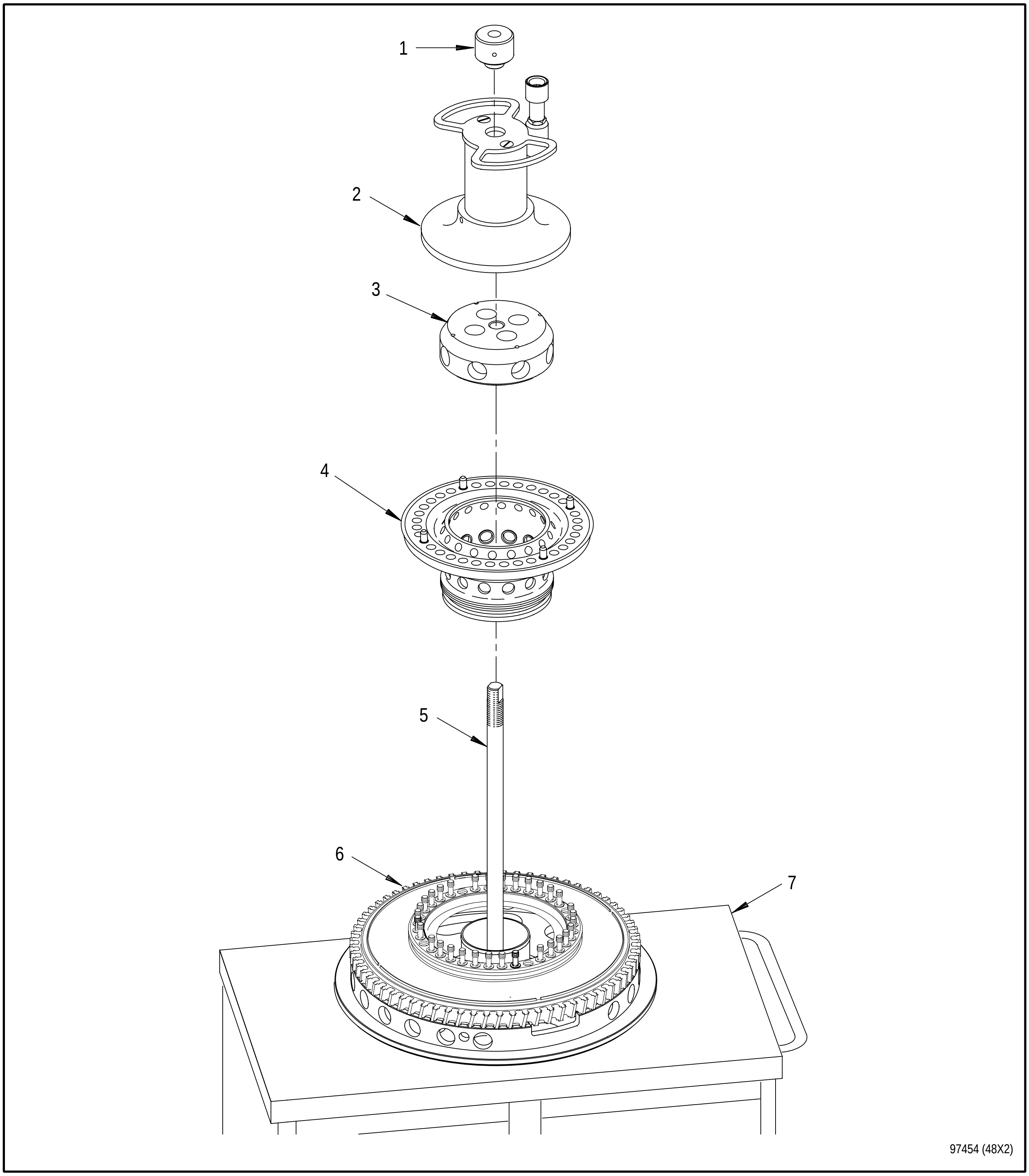


Figure 6. Front Turbine Hub Assembly - Installation onto First Stage Turbine Disk

(4) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(5) Work PWA 55380 pump to seat hub(4) using a minimum pressure of 500 psig, not to exceed maximum pressure of 3500 psig.

(6) Allow assembly temperature to normalize before releasing pressure.

(7) Release pressure from PWA 55380 pump, disconnect pump from hydraulic cylinder assembly(2).

(8) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-100 ring(3), and detail-103 shaft(5).

(9) Visually inspect to ensure hub is seated on 1st stage disk.

f. Remove 1st stage disk and hub assembly from stand(7).

g. Remove detail-19 ring(5, figure 5) from stand(6).

Legend for figure 6

1. Nut
2. Hydraulic cylinder assembly
3. Ring
4. Turbine front hub assembly
5. Shaft
6. First stage turbine disk
7. PWA 57830 stand

5. SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - INSTALLATION ONTO SECOND STAGE TURBINE DISK.
(See Figures 7 through 9.)

a. Place 2nd stage turbine disk(8, figure 7) tierod flange down on bench. Locate X marks on disk fir trees and transfer X marks to front face using Colorbrite No. 2101 silver pencil or equivalent.

b. Place 2nd stage turbine blade retaining plate assembly(5) on bench rear face up. Locate X mark on rear face of tabs. Pin(6, figure 8) in tab adjacent to X mark is offset pin. Mark pin location using Colorbrite No. 2101 silver pencil or equivalent. Verify pin location aligns with slots in lugs on 2nd stage disk.

c. Install 2nd stage disk(8, figure 7) onto PWA 57830 stand as follows:

(1) Lower PWA 57830 detail-23 ring(9) onto base of stand(11).

(2) Lower 2nd stage disk(8), with tierod flange facing up, onto detail-23 ring(9) so that counterweight flange of disk sits on detail-23 ring(9).

(3) Align 2nd stage disk(8) on stand(11) by installing detail-49 adapter(7), large flange facing up, onto disk so that OD of adapter fits into disk bore and ID of adapter fits into base of stand. Remove detail-49 adapter(7).

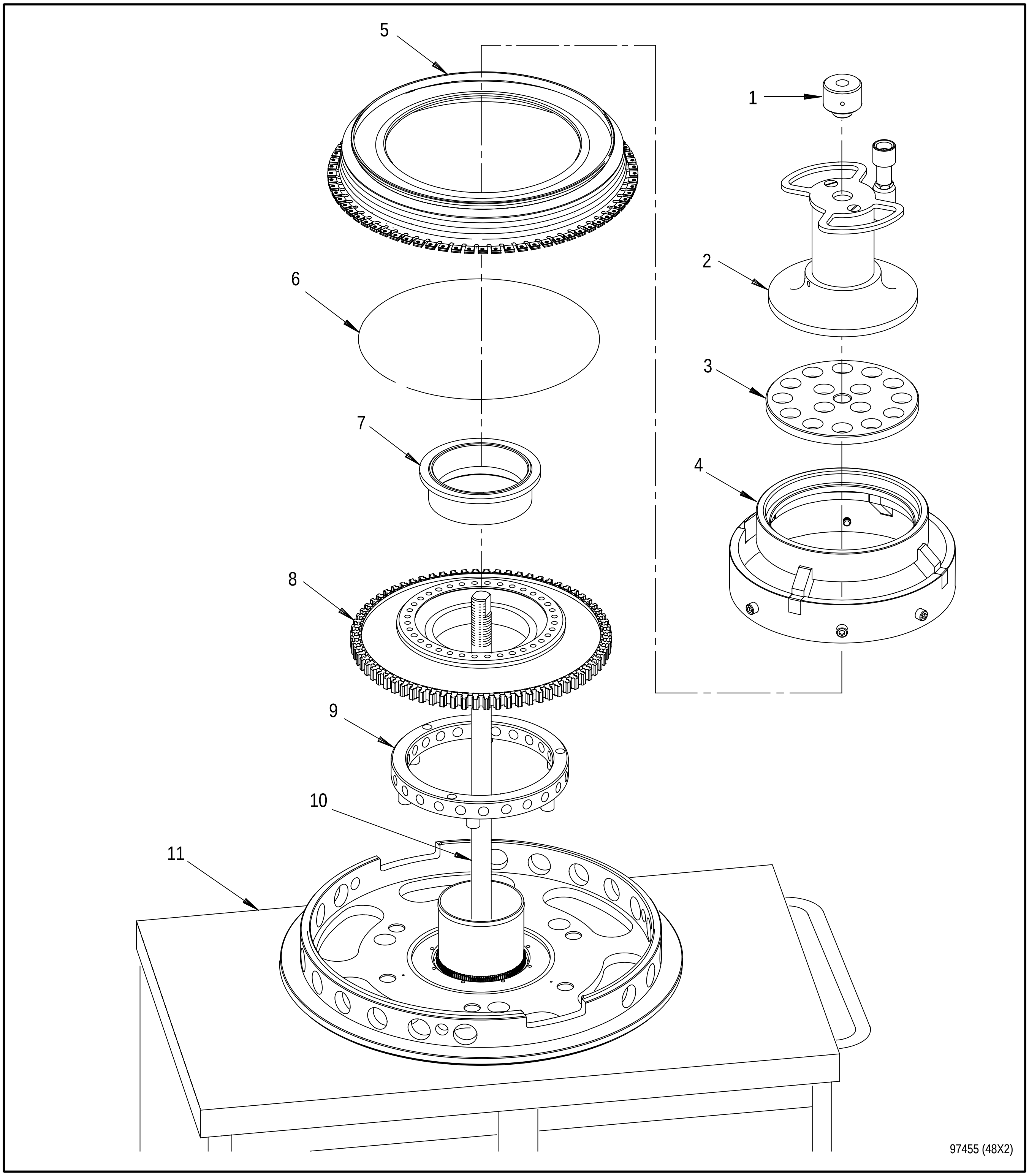


Figure 7. Second Stage Turbine Blade Retaining Plate Assembly - Installation onto Second Stage Turbine Disk

Legend for figure 7

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Clamp assembly
5. Second stage turbine blade retaining plate assembly
6. Second stage turbine rotor seal
7. Adapter
8. Second stage turbine disk
9. Ring
10. Shaft
11. PWA 57830 stand

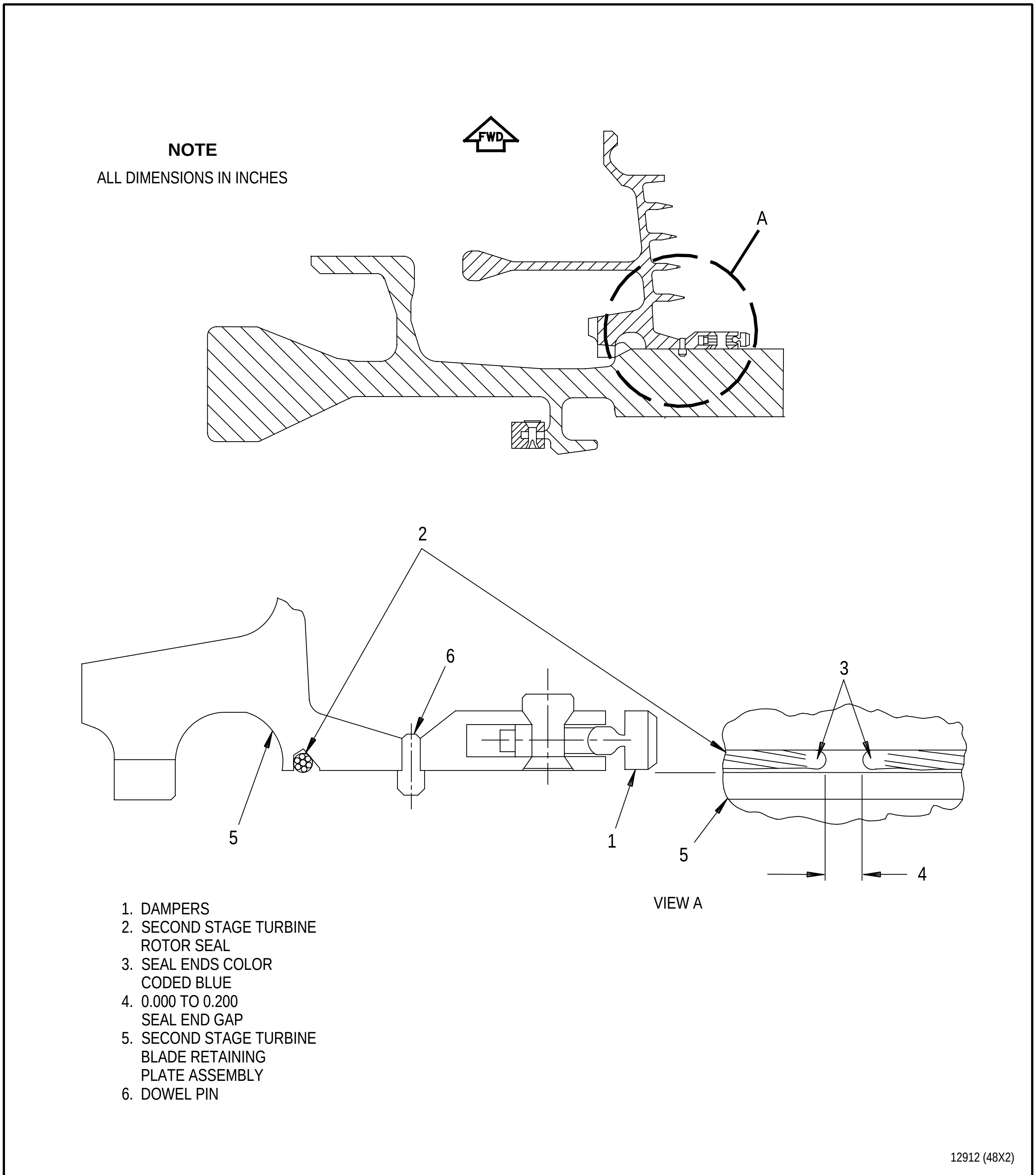


Figure 8. Second Stage Turbine Blade Retaining Plate and Rotor Seal - Installation

d. Verify dampers(1, figure 8) of retaining plate move freely.

e. Install retaining plate(5, figure 7) as follows:

(1) Position PWA 57410 heater on 2nd stage disk(8) retaining plate snap diameter.

(2) Connect heater to PWA 61685 control and heat disk at 200° to 225°F (93° to 107°C) for a minimum of 20 minutes.

(3) Install 2nd stage turbine rotor seal(6) and (blue coded ends)(2 and 3, figure 8) in groove of retaining plate(5) and secure with hand-softened beeswax, or Permabond 910 adhesive. Ensure seal end gap(4) is 0.000 to 0.200 inch.

NOTE

Retaining plate installation shall be performed rapidly once heater is removed from disk so snap diameter does not lose its heat.

(4) Remove heater from 2nd stage disk(8, figure 7). Ensure mating surfaces are clean and free of foreign material. Install detail-49 adapter(7), large flange facing up, onto 2nd stage disk(8) so that OD of adapter fits into disk bore and ID of adapter fits into base of stand(11). Thread detail-103 shaft(10) into base of stand(11) and install retaining plate(5), aligning previously marked offset dowel pin in retaining plate with slot at X mark on disk fir tree.

(5) Lower PWA 57830 detail-96 clamp assembly(4) onto forward flange of retaining plate(5).

(6) Lower detail-102 plate(3) onto detail-96 clamp assembly(4).

(7) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(10) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(9) Work pump to seat retaining plate(5), using a minimum pressure of 500 psig, maximum pressure not to exceed 1200 psig.

(10) Allow temperature of assembly to normalize before releasing hydraulic pressure.

(11) Release pressure; then disconnect pump from hydraulic cylinder assembly(2).

(12) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), detail-96 clamp assembly(4), and detail-103 shaft(10).

(13) Secure retaining plate to disk at four equally spaced places using lockwire.

f. Verify that retaining plate is seated on 2nd stage disk by attempting to insert a 0.002 inch feeler gage between retaining plate and disk fir trees. Do not measure between fir trees. If gage cannot be inserted, retaining plate is properly seated. Ensure rotor seal is located in proper position.

NOTE

There are two configurations 2nd stage turbine blade retaining plate damper(1, figure 9). One has seven tangs on forward surface only and one has seven tangs on both forward and aft surfaces.

f1. Install turbine blade retaining plate damper with seven tangs on forward surface per step g. Install damper with seven tangs on both forward and aft surfaces per step g1.

CAUTION

Failure to properly install turbine blade retaining plate damper with tangs only on forward surface may result in a 2nd stage blade stretch condition.

g. Install turbine blade retaining plate damper with seven tangs on forward surface as follows:

(1) Place retaining plate damper(1), with tangs facing up, on PWA 57830 stand next to 2nd stage turbine disk(3) and 2nd stage blade retaining plate assembly(2).

(2) Apply 3 to 4 drops of permabond 910 adhesive at eight equally spaced locations on outside flat of damper.

(3) With tangs facing up, compress retaining plate damper and install into ID of 2nd stage blade retaining plate.

(4) Press retaining plate damper down to seat tangs against front flange of 2nd stage blade retaining plate. Hold damper radially outward until adhesive sets.

g1. Install turbine blade retaining plate damper with seven tangs on both forward and aft surfaces as follows:

(1) Place retaining plate damper(1), either surface up, on PWA 57830 stand next to 2nd stage turbine disk(3) and 2nd stage blade retaining plate assembly(2).

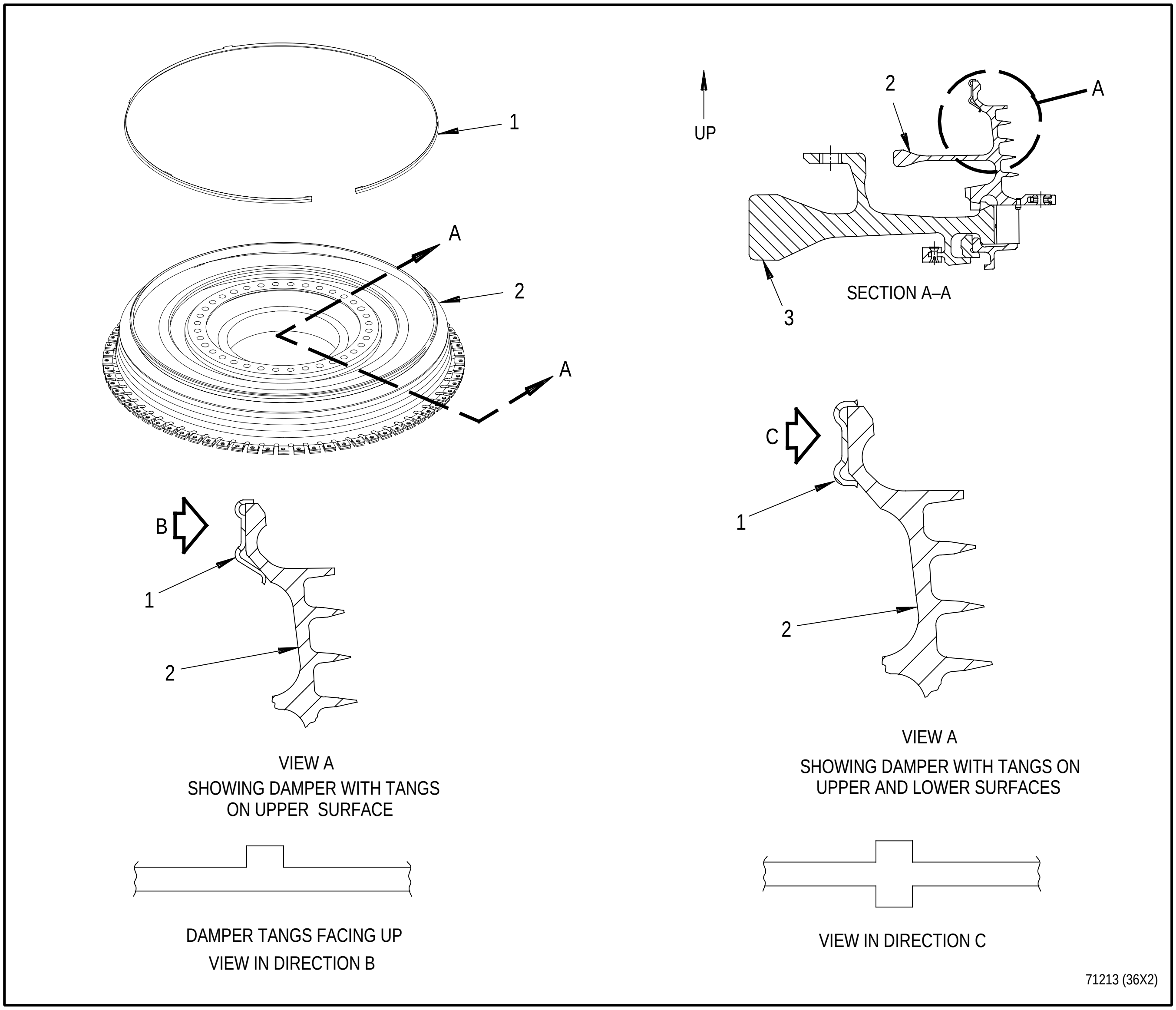
(2) Apply 3 to 4 drops of permabond 910 adhesive at eight equally spaced locations on outside flat of damper.

(3) Compress retaining plate damper and install into ID of 2nd stage blade retaining plate.

(4) Press retaining plate damper down to seat tangs against front flange of 2nd stage blade retaining plate. Hold damper radially outward until adhesive sets.

h. Remove detail-49 adapter(7, figure 7).

i. Remove 2nd stage disk and retaining plate from stand(11) and place on bench retaining plate facing up. Remove detail-23 ring(9) from stand(11).



1. Second stage turbine blade retaining plate damper
2. Second stage turbine blade retaining plate
3. Second stage turbine disk

Figure 9. Turbine Blade Retaining Plate Damper - Installation

6. FIRST STAGE TURBINE ROTOR BLADES - INSTALLATION.

(See Figure 10.)

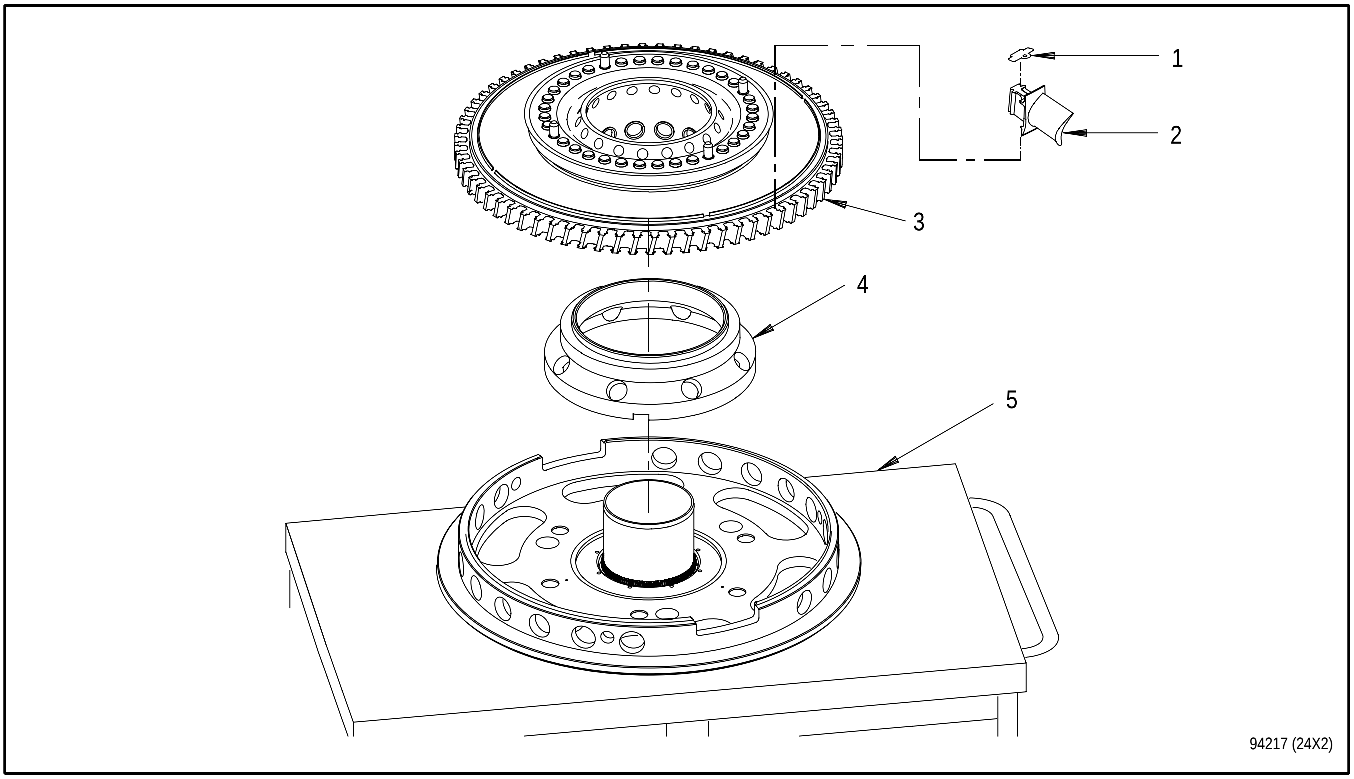
a. Install PWA 57830 detail-19 ring(4, figure 10) onto base of stand(5).

b. Lower 1st stage turbine disk and turbine front hub assembly(3) onto detail-19 ring(4) so that hub engages center portion of stand(5).

CAUTION

Failure to verify PNs may result in configuration mismatch and cause engine damage or failure.

b1. Verify correct engine parts to be installed. Refer to T.O. 2J-F100-54.



1. First stage turbine rotor blade platform seal
2. First stage turbine rotor blade
3. First stage turbine disk and trubine front hub assembly
4. Ring
5. PWA 57830 stand

Figure 10. First Stage Turbine Rotor Blades - Installation

c. Select moment-weight blade pairs as follows:

(1) Determine quantity of blades required. Ensure that all blades are marked with moment-weight on concave side of airfoil and paired properly within 0.05 ounce-inch. Refer to T.O. 2J-F100-53-8, WP 318 00.

NOTE

Paired moment-weighed blades consist of two blades having moment-weight within 0.05 ounce-inch.

(2) Select blades in moment-weighted pairs so that complete set is available to blade entire disk. Each pair shall be located 180 degrees opposite each other when installed in disk. If blades were moment-weighed but individual blades could not be arranged into paired sets, use pairing procedure described in step d.

d. The following procedure applies when arranging an entire set of blades that cannot be paired by moment-weight (within 0.05 ounce-inch) per WP 318 00.

(1) Arrange 1st stage turbine rotor blades(2) on table by moment-weight, heaviest to lightest.

(2) Mark two heaviest blades with a pairing Letter A. Mark next two heaviest blades with pairing Letter B, using Colorbrite No. 2101 silver pencil or equivalent. Continue in this manner until all blades are identified with pairing letter.

(3) For each pair of blades, mark their moment-weight difference on heavier blade.

(4) Rearrange blades on table in two columns by moment-weight difference. Start with pair that have largest moment-weight difference. Place heavier blade in Column I and its paired blade in Column II. Continue with next largest moment weight difference pair, but alternate and place heavier blade in Column II and its paired blade in Column I. Third pair will have the heaviest blade in Column II, etc.

Example:

Moment-weight Difference	Column I	Column II
Largest difference	Heaviest	Paired blade
Second largest difference	Paired blade	Heaviest
Third largest difference	Paired blade	Heaviest
Fourth largest difference	Heaviest	Paired blade
Fifth largest difference	Heaviest	Paired blade

(5) Starting at top of Column I, number each blade in consecutive order downward 1 through 34 on convex side of air foil. Number blades in column II starting at top downward 35 through 68.

(6) Record the heat code of each 1st stage blade by installed position on an AFTO 44 Addendum form. A copy of the completed form is to be filed with the AFTO 44 records for the module.

e. Install 1st stage turbine blades(2) into 1st stage disk(3) as follows:

CAUTION

Ensure PN for 1st stage blades being installed are verified as F100-PW-229. Refer to T.O. 2J-F100-54. It is possible to install F100-PW-220 configuration blades which could result in engine damage.

(1) Install a 1st stage turbine rotor blade platform seal(1) to each blade(2) with large notch of seal toward leading (thicker) edge of blade. Ensure ends of seal are located under retaining tangs on blade.

(2) Prebend platform seals to reduce interference when installing blades.

(3) Locate No. 1 blade slot, previously identified, adjacent to X mark.

CAUTION

Blades shall be inserted into disk with leading (thicker) edge down. It is possible to install blades into disk backwards (trailing edge down), which could cause engine damage.

(4) Start blade(2), with seal installed, leading edge down into No. 1 blade slot.

(5) Install succeeding blade(s) of each blade set with seal(s), in clockwise direction from No. 1 blade slot.

(6) Continue completely around disk until all blades (sets) are installed.

(7) Straighten platform seals with a nylon drift or equivalent.

7. FIRST STAGE TURBINE ROTOR SEAL AND FIRST STAGE TURBINE BLADE REAR RETAINING PLATES - INSTALLATION.

(See Figure 11.)

a. Install 1st stage turbine blade rear retaining plates(4, figure 11) as follows:

(1) Pan weigh 34 plates and mark weight (to nearest tenth gram) on each plate using Colorbrite No. 2101 silver pencil or equivalent.

(2) Arrange plates into two columns starting with the heaviest pair. The heavier plate in the pair shall be in the left column. Place the second heaviest pair beneath the first pair except put the heavier plate in the right column. Continue this sequence, alternating columns, for the heavier plate in the pair.

(3) Starting at top of left column, number plates in consecutive order downward 1 through 17. Number plates in right column starting at top downward 18 through 34 using Colorbrite No. 2101 silver pencil or equivalent.

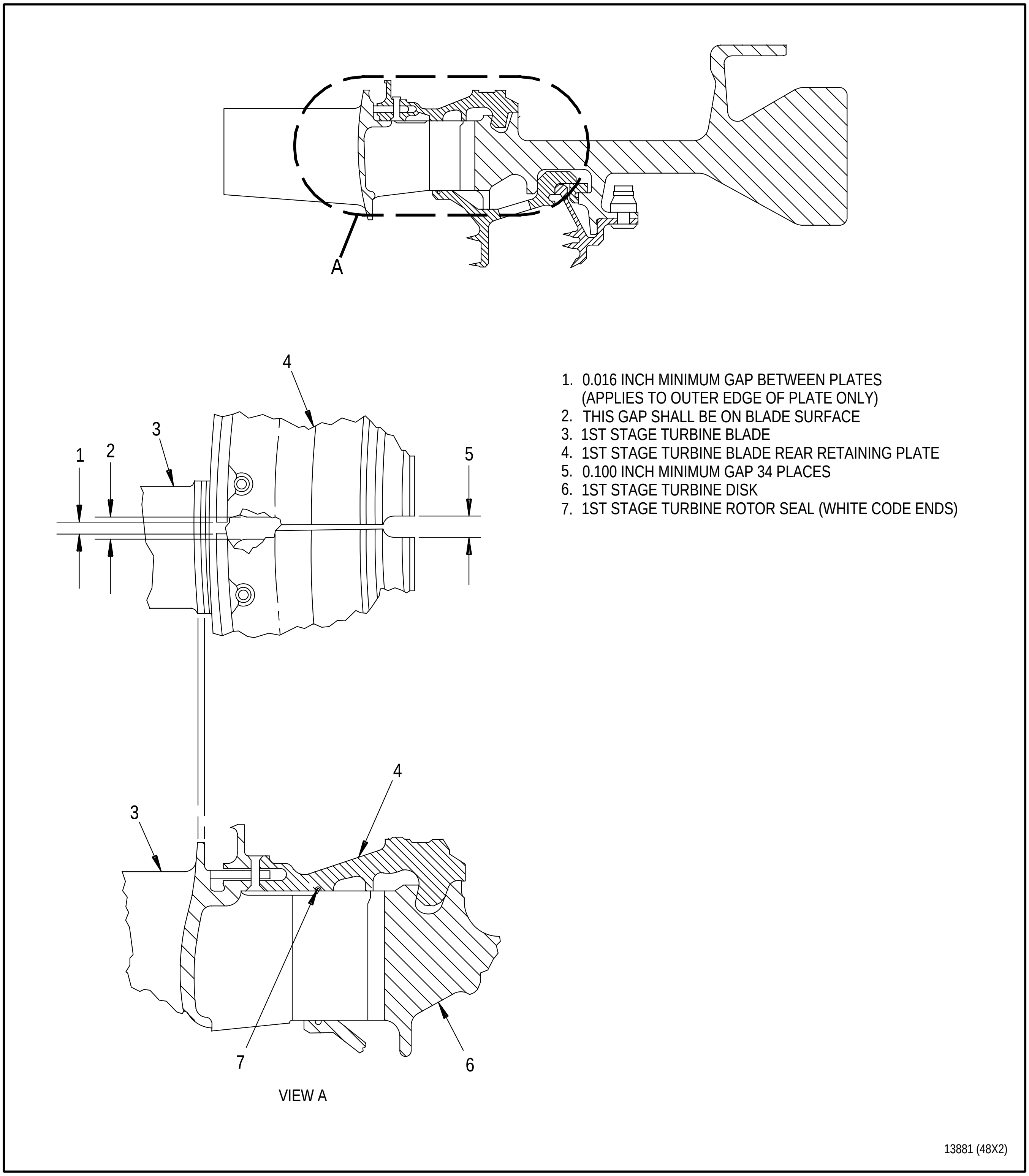


Figure 11. First Stage Turbine Rotor Seal and First Stage Turbine Blade Rear Retaining Plates - Installation

(4) Install No. 1 retaining plate(4) in line with No. 1 blade(3). Edge of plate shall be located on face of No. 1 blade root(1). Align antirotation lug with mating slot of disk(6).

(5) Install 1st stage turbine rotor seal(7) (white coded ends) in ID groove of retaining plate(4).

(6) Continue installing plates(4) in numerical sequence and in clockwise direction. Before installing last retaining plate, ensure turbine rotor seal(7) end gap is zero to 3/16 inch. After last plate is installed, verify that gaps(1 and 5) can be maintained.

CAUTION

Incorrect turbine rotor seal installation will decrease blade life.

(7) Ensure turbine rotor seal is properly positioned in retaining plate groove with end gap located on a blade root.

(8) Remove one retaining plate(4) and apply Permabond 910 adhesive to seal groove. Install treated plate(4) securing turbine rotor seal(7) in plate groove. Ensure adhesive does not contact dampers in plates and that dampers have freedom of movement or turbine balance will be affected. Continue gluing procedure for remaining 33 plates. Hold each plate radially outward to maintain gaps(1 and 5) until adhesive sets.

(9) Ensure all plates are flat against face of disk and blades and that four plates are engaged in four antirotation slots of disk.

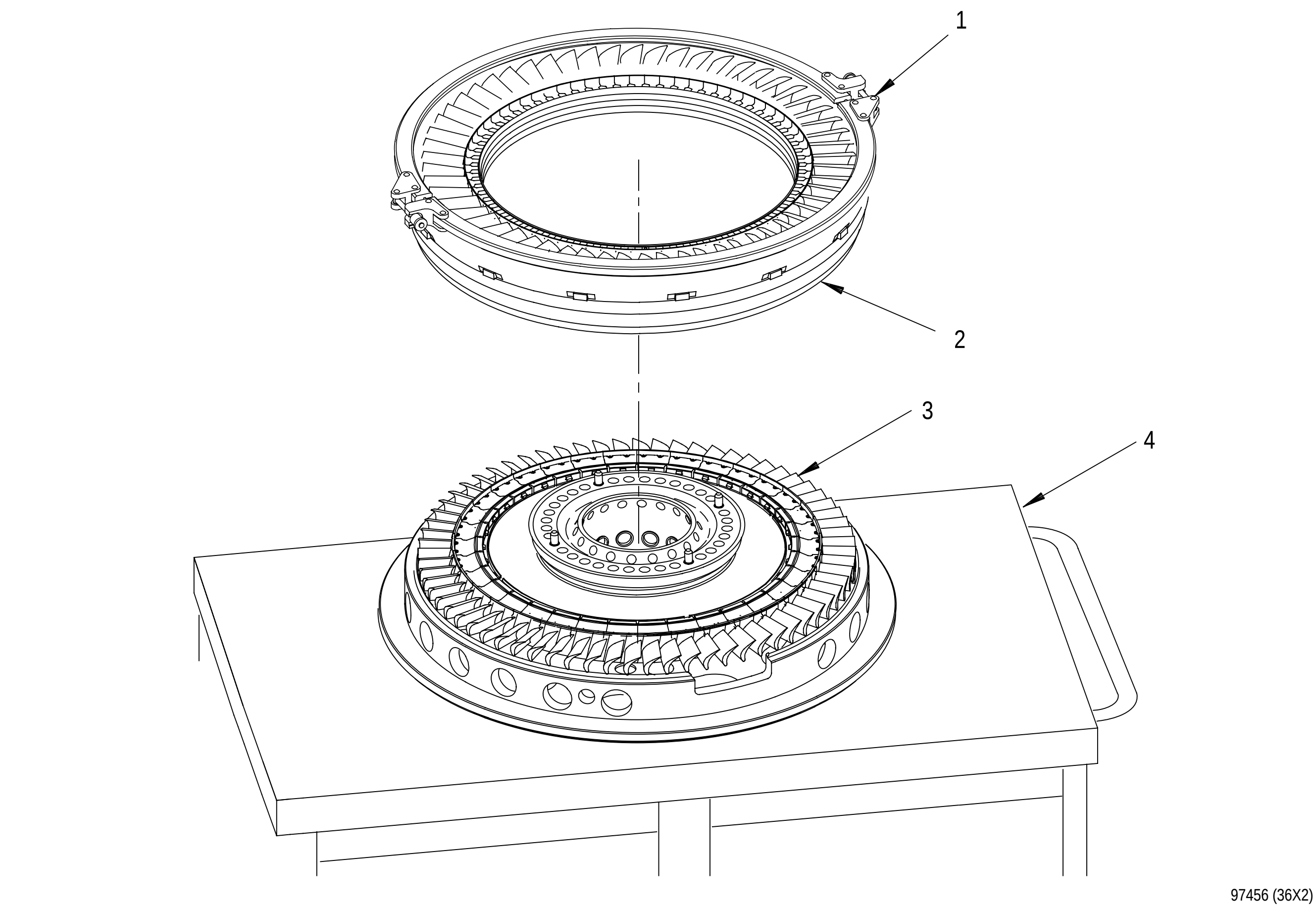
8. FIRST STAGE TURBINE DUCT AND SUPPORT SET, SECOND STAGE TURBINE VANES, AND SECOND STAGE TURBINE AIR SEALING RING ASSEMBLY - INSTALLATION. (See Figure 12.)

a. If necessary, install PWA 57830 detail-89 ring clamp(1, figure 12) onto duct and support set(2) as follows:

(1) Lower detail-89 ring clamp(1) onto rear flange of duct and support set(2).

(2) Tighten detail-85 knobs to secure detail-89 ring clamp(1) to duct and support set(2).

b. Lift and carefully lower duct and support set(2), front flange down, over 1st stage disk and blades(3) until front flange rests on base of stand(4).



1. Ring clamp
2. First stage turbine duct and support set, second stage turbine vanes, and second stage turbine air sealing ring assembly
3. First stage turbine disk and blades
4. PWA 57830 stand

Figure 12. First Stage Turbine Duct and Support Set, Second Stage Turbine Vanes, and Second Stage Turbine Air Sealing Ring Assembly - Installation

9. SECOND STAGE TURBINE DISK AND SECOND STAGE TURBINE BLADE RETAINING PLATE ASSEMBLY - INSTALLATION.
(See Figures 13 and 14.)

CAUTION

Damage to retaining plate dampers may result if 2nd stage turbine blades and rear retaining plate are installed in disk before disk and retaining plate assembly are installed on turbine hub.

a. Ensure 2nd stage turbine blades and rear retaining plate are not installed in 2nd stage turbine disk.

b. Locate offset dowel pin hole in 2nd stage turbine disk(4, figure 13) and offset dowel pin in turbine front hub assembly(6). Mark offset dowel pin and hole using Colorbrite No. 2101 silver pencil or equivalent.

c. Install 2nd stage turbine disk and retaining plate assembly(4) as follows:

(1) Before installing heater, ensure exposed heater detail fasteners are tight. Loose details may fall off and drop into engine during assembly operations.

(2) Position PWA 57405 heater on hub snap diameter.

NOTE

A minimum temperature differential of 150°F shall be attained prior to installing 2nd stage disk to hub.

(3) Connect heater to PWA 61685 control and heat snap diameter to 265°F (129°C) minimum, maximum temperature not to exceed 600°F (316°C).

(4) Chill retaining plate front flange in freezer or dry ice for 20 to 30 seconds.

Legend for figure 13

1. Nut
2. Hydraulic cylinder assembly
3. Ring
4. Second stage turbine disk and retaining plate assembly
5. Shaft
6. First stage turbine disk and hub assembly
7. PWA 57830 stand

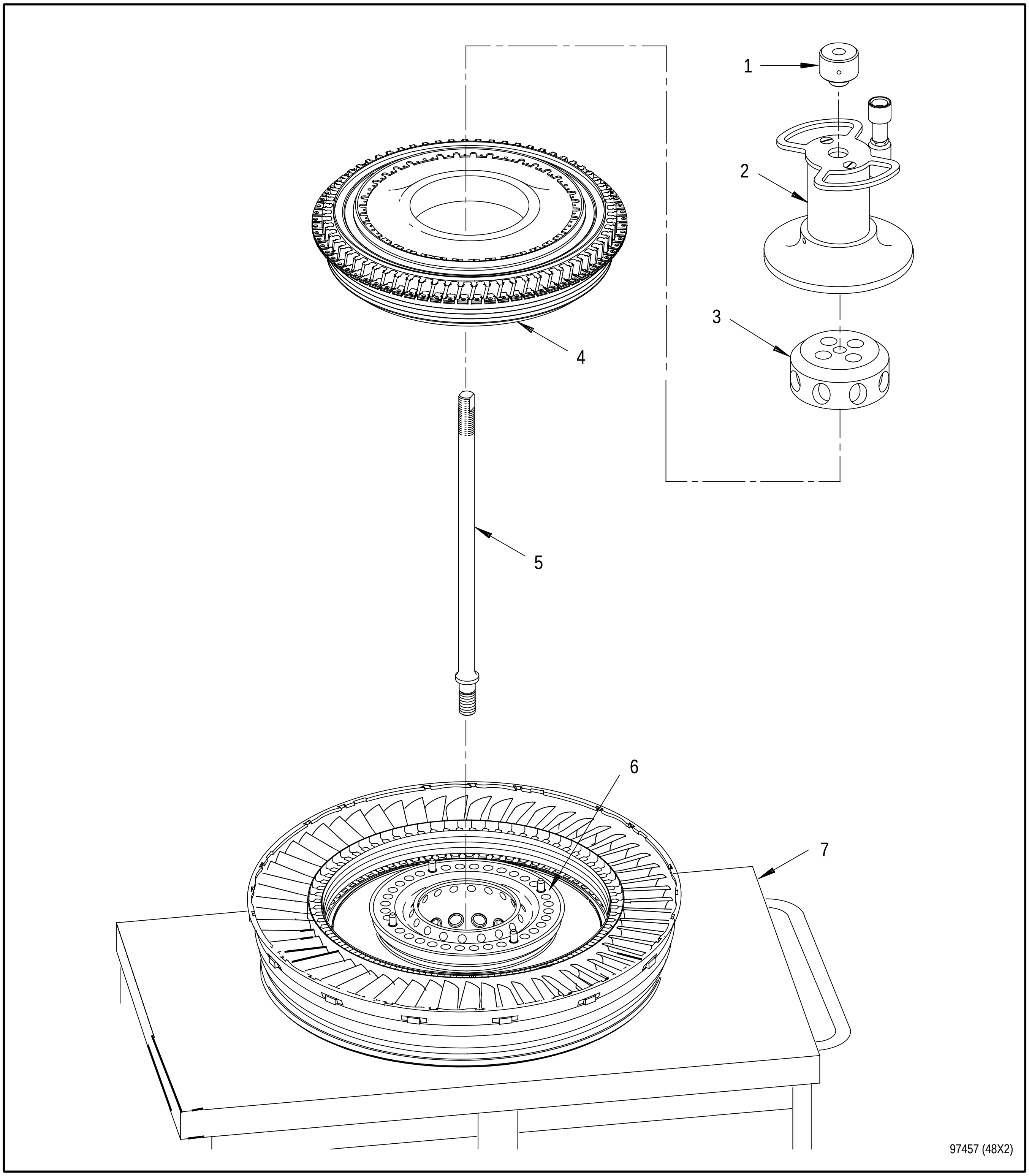


Figure 13. Second Stage Turbine Disk and Retaining Plate Assembly - Installation

NOTE

Second stage disk and retaining plate installation shall be performed rapidly once heater is removed and retaining plate flange has been chilled.

(5) Remove heater from hub, ensure mating surfaces are clean and free of foreign material.

CAUTION

- Failure to ensure proper alignment of dowel pins in retaining plate with notches in 2nd stage disk may cause damage to retaining plate and disk.
- Failure to ensure proper alignment of 2nd stage disk and retaining plate with hub may cause damage to air seals.

NOTE

Second stage disk may separate from retaining plate during installation.

(6) Ensure turbine rotor seals maintain proper positioning during installation of 2nd stage disk and retaining plate. Ensure dowel pins in retaining plate align with notches in 2nd stage disk.

(7) Install 2nd stage disk and retaining plate(4), aligning marked offset dowel pin in hub with marked offset hole in 2nd stage disk tierod flange.

(8) Install PWA 57830 detail-103 shaft(5) into base of stand(7).

(9) Lower PWA 57830 detail-100 ring(3) (tapered end up) so that flange of ring engages 2nd stage disk ID bore.

(10) Lower hydraulic cylinder assembly(2) onto detail-100 ring(3). Thread detail-9 nut(1) onto detail-103 shaft(5) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(11) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(12) Actuate pump to seat 2nd stage disk and retaining plate using a minimum pressure of 1000 psig, maximum pressure not to exceed 5000 psig.

(13) Allow assembly temperature to normalize before releasing pressure.

(14) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(15) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-100 ring(3), and detail-103 shaft(5).

(16) Verify turbine rotor seals maintained proper positioning.

(17) Verify correct assembly and seating of parts by measuring axial gap(1, figure 14) between 2nd stage disk flange and turbine front hub assembly using feeler stock.

(18) Rotate case and duct set to ensure retaining plate is installed properly. Case and duct set should turn freely.

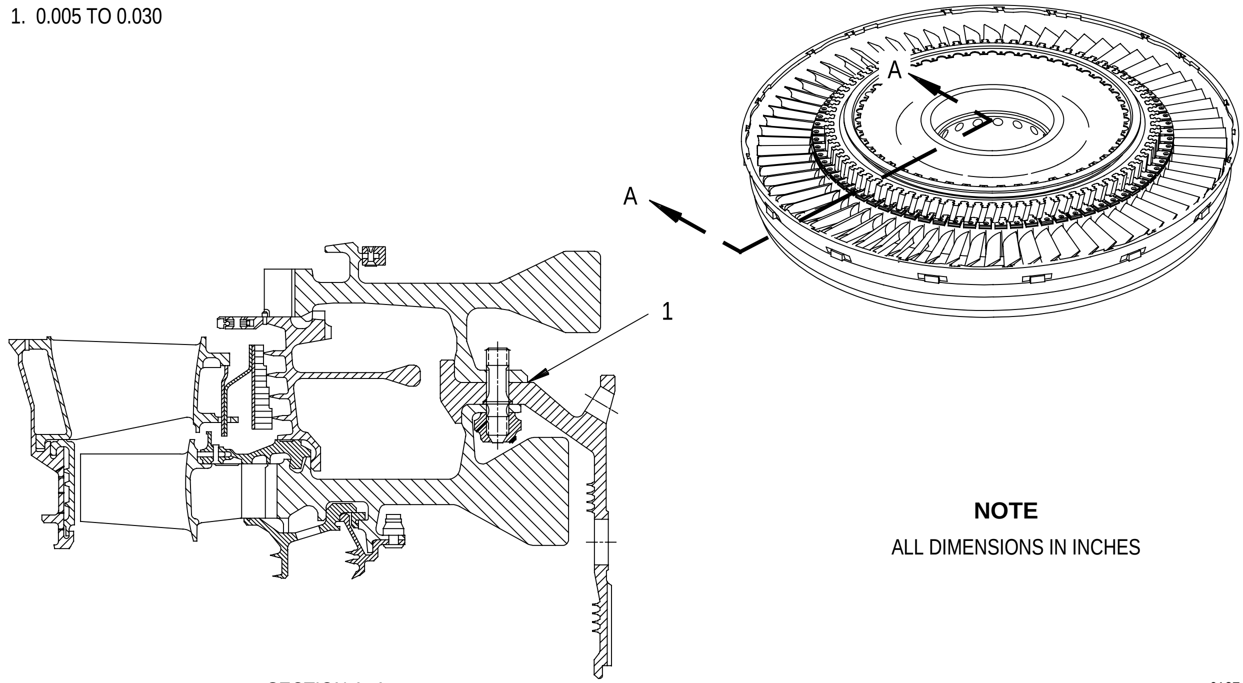


Figure 14. Rear Compressor Drive Turbine - Seating Measurement

10. TIEROD NUTS - INSTALLATION.

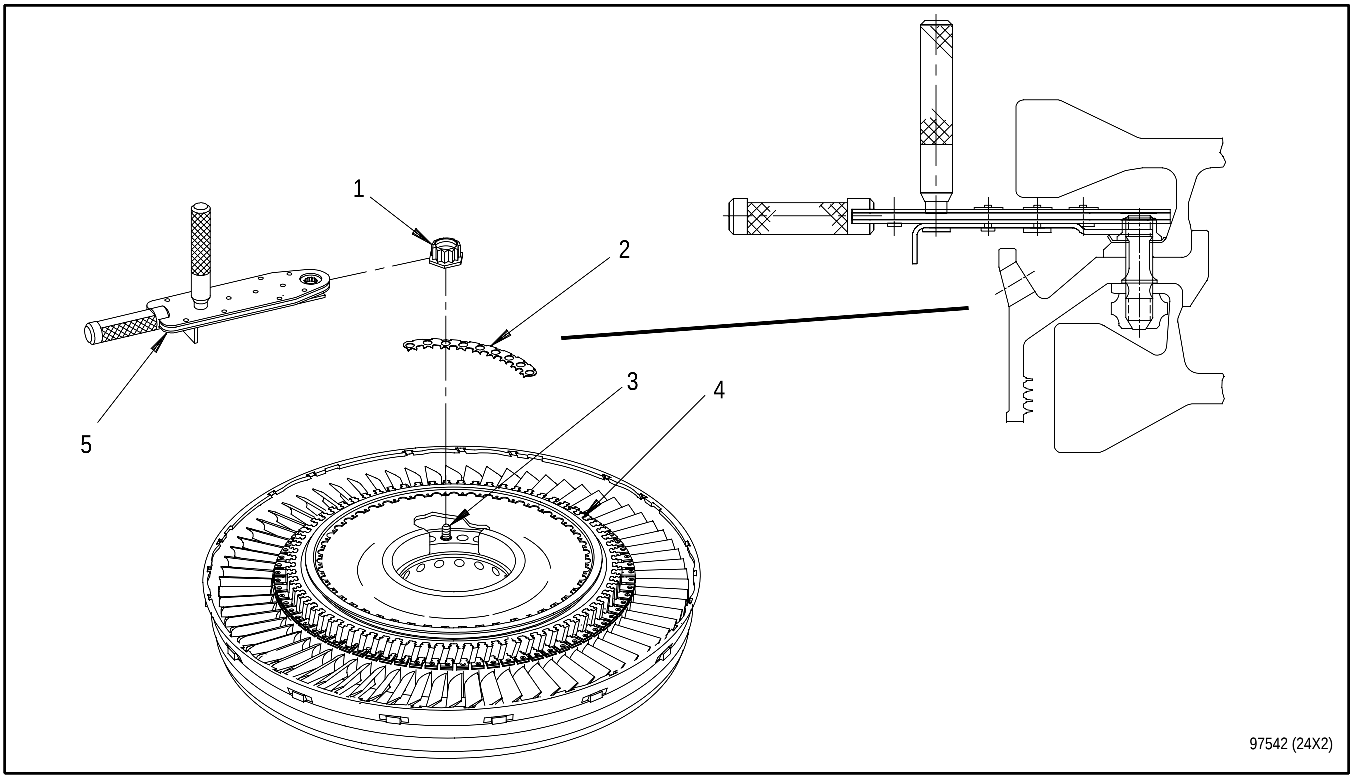
(See Figures 15 through 17.)

a. Install new key washers(2, figure 15) and tierod nuts(1) as follows:

(1) Ensure tierod nut(1) threads and washer face are coated with PWA 36545-3 antigalling compound, baked-on. Refer to T.O. 2J-F100-53-1, SWP 098 07 (SPOP 748).

(2) Prior to reuse only, strip and recoat tierod nut threads and washer face with PWA 36545-3 antigalling compound. Nut run on torque shall not exceed five pound-inches.

(3) If necessary, burnish excess PWA 36545-3 antigalling compound from tierod nut(1) threads using medium brass brush. Take care not to expose parent metal. If tierod nut threads and washer face are not properly coated with antigalling compound, required torque may not be reached.



1. Tierod nut
2. Key washer
3. Tierod
4. Second stage turbine disk
5. Nut starter assembly

Figure 15. Tierod Nuts - Installation

(4) Install key washers(2) (prebent tabs facing up and inward) over tierods(3) and dowel pins. Position key washers so that a dowel pin is located in center hole of key washer. (See figure 16.)

(5) Place a tierod nut(1, figure 15) into PWA 57895 detail-2 nut starter assembly(5). Slide detail-2-14 retainer forward to hold nut in place.

(6) Position nut starter assembly(5) through 2nd stage disk(4) bore and align scribe mark on nut starter assembly(5) with 2nd stage disk ID. Turn handle clockwise to start nut.

(7) Repeat steps (3) and (4) for remaining 31 tierod nuts.

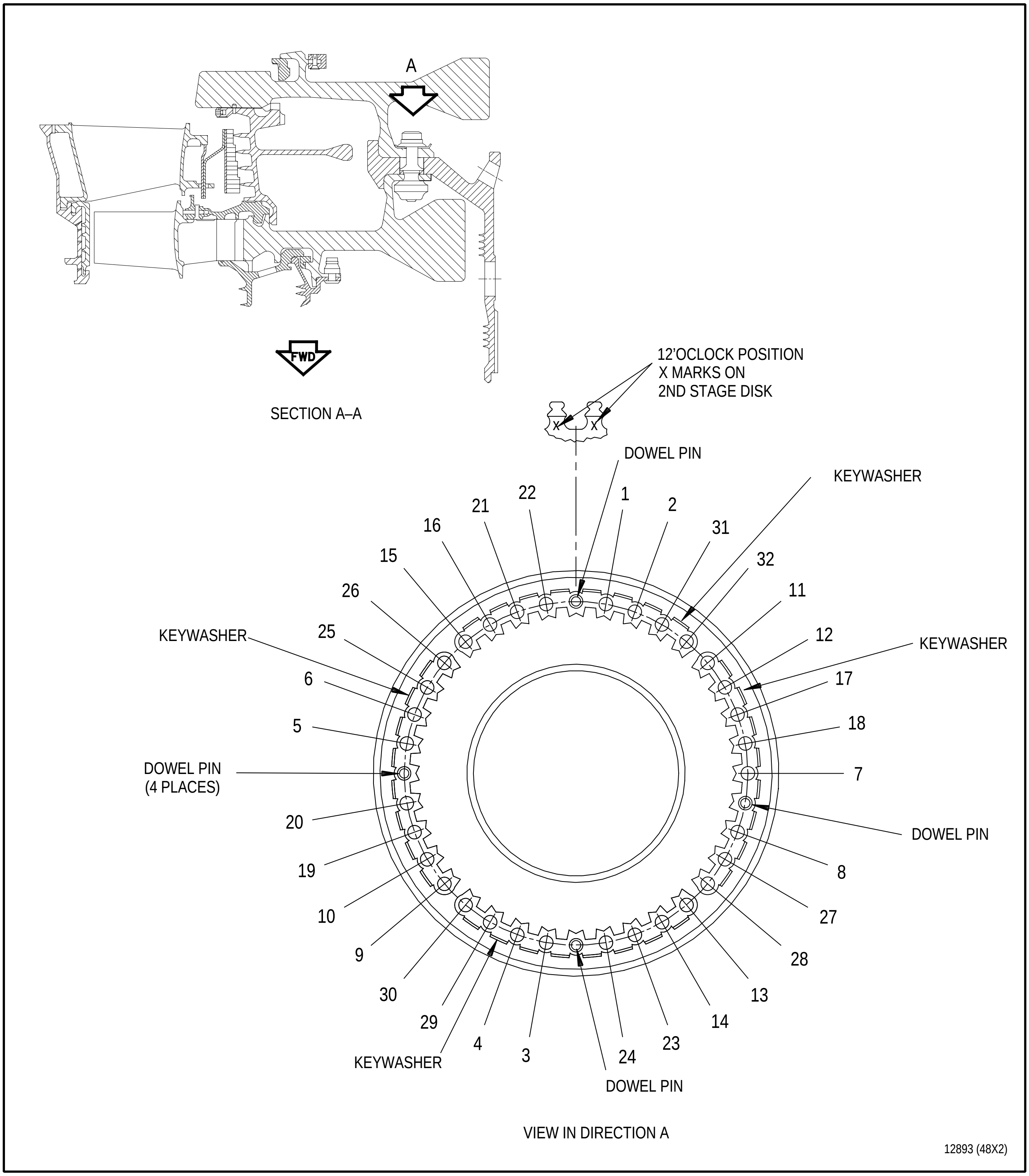


Figure 16. Tierod Nut Tightening Sequence and Key Washer Locations

b. Install PWA 57895 detail-4 torque adapter assembly as follows:

(1) Locate X marks on rear face of 2nd stage turbine disk. This is 12 o’clock position. (See figure 16.)

(2) Locate first tierod in clockwise direction from 12 o’clock position. This is No. 1 tierod.

(3) Install detail-4-4 locator ring assembly(2, figure 17) so hole in ring assembly marked No. 1 is directly over No. 1 tierod. Ensure ring assembly is fully seated on 2nd stage disk(3). Secure with set screws.

(4) Insert detail-4-3 wrench assembly (1) so socket fits over tierod nut and dowel pin fits into hole in detail-4-4 locator ring assembly(2).

c. Torque tierod nuts as follows:

(1) Ensure run-on torque shall not exceed 5 pound-inches on tierod nuts to be reused.

(2) Torque 32 tierod nuts in sequence stamped on detail-4-4 locator ring assembly(2) 110 to 120 pound-inches.

(3) In same sequence, torque tierod nuts 140 to 150 pound-inches.

(4) In same sequence, one nut at a time, loosen tierod nut to zero torque, then apply 36 to 42 pound-inches. Loosen detail-4-7 thumbscrew(5) and set detail-4-1 scale assembly(4) to zero degrees. Further tighten nut through an angle of turn of 54 to 58 degrees. Check preload on tierod nuts; torque shall be between 140 and 455 pound-inches. Repeat procedure for remaining 31 tierod nuts, one at a time.

(5) Verify that 2nd stage disk is seated by attempting to insert a 0.001 inch feeler gage between 2nd stage disk flange and turbine front hub assembly. If a 0.001 inch feeler gage can be inserted, proceed as follows:

(a) Relieve torque from all 32 tierod nuts.

(b) Repeat torquing procedures per steps (1) through (4).

Legend for figure 17

1. Wrench assembly
2. Locator ring asembly
3. Second stage turbine disk
4. Scale assembly
5. Thumbscrew

(c) Recheck seating of disk using 0.001 inch feeler gage. If gage can still be inserted between disk flange and hub, assembly must be disassembled, mating surfaces checked for foreign material, and reassembled.

(6) Verify wire rope is in groove in 2nd stage turbine disk before installing 2nd stage turbine blades.

(7) Remove detail-4-3 wrench assembly(1) and detail-4-4 locator ring assembly(2).

NOTE

Turbine will be disassembled if turbine balance is not acceptable. To save time and parts, key washer tabs will be bent after acceptable balance has been accomplished.

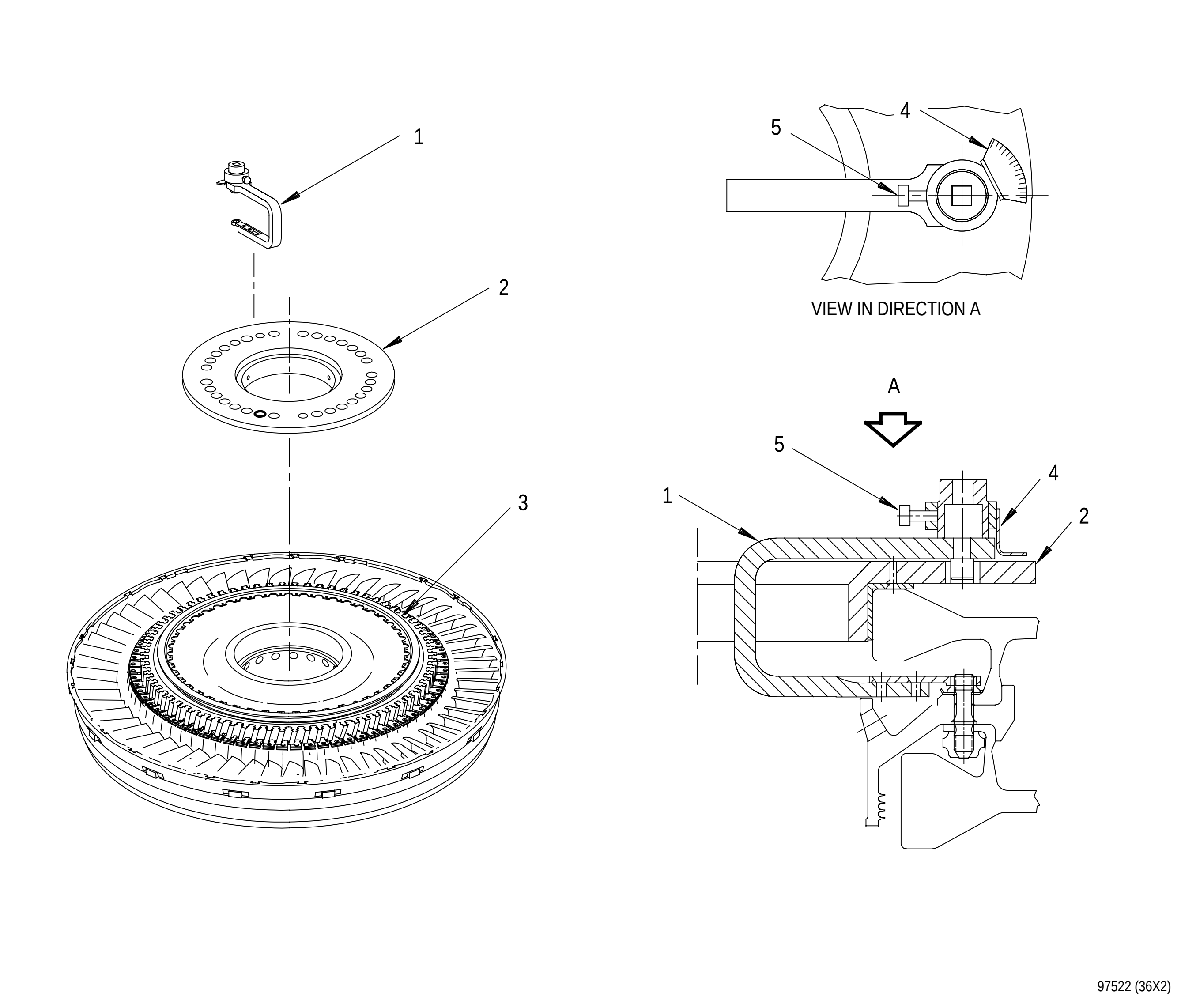


Figure 17. PWA 57895 Torque Adapter Assembly - Installation

11. SECOND STAGE TURBINE ROTOR BLADES - INSTALLATION.

(See Figure 18 and 18A.)

a. Select moment-weight blade pairs as follows:

(1) Determine quantity of blades required. Ensure that all blades are marked on concave side of airfoil with moment-weight and paired properly within 0.05 ounce-inch per WP 318 00.

NOTE

Paired moment-weighed blades consist of two blades having moment-weight within 0.05 ounce-inch.

(2) Select blades in moment-weighted pairs so that complete set is available to blade entire disk. Paired blades shall be located 180 degrees opposite each other when installed in disk. If blades were moment-weighed but individual blades could not be arranged into paired sets, use pairing procedure described in step b.

b. The following procedure applies when arranging an entire set of blades that cannot be paired by moment-weight (within 0.05 ounce-inch) per WP 318 00.

(1) Arrange 2nd stage turbine rotor blades(1, figure 18) on table by moment-weight, heaviest to lightest.

(2) Mark two heaviest blades with a pairing Letter A, mark next two heaviest blades with pairing Letter B using Colorbrite No. 2101 silver pencil or equivalent. Continue in this manner until all blades are identified with pairing letter.

(3) For each pair of blades, mark their moment-weight difference on heaviest blade.

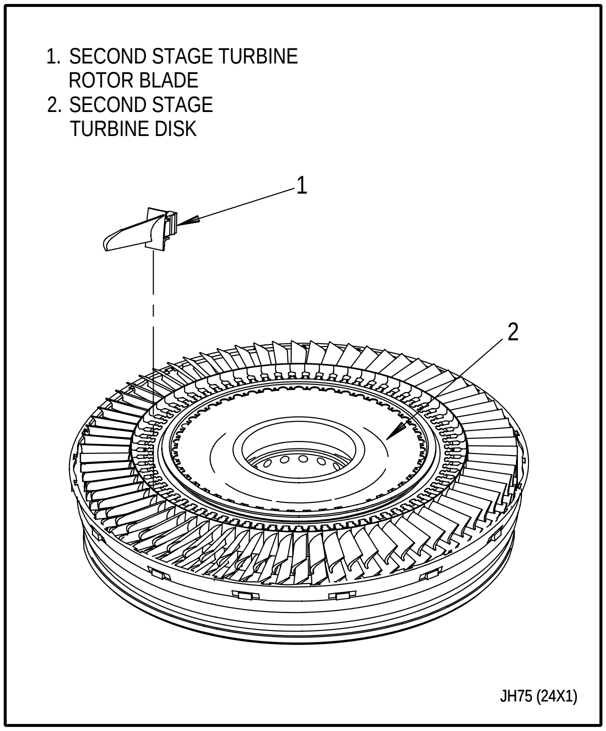


Figure 18. Second Stage Turbine Rotor Blades - Installation

(4) Rearrange blades on table in two columns by moment-weight difference as shown in the following examples. Either example may be followed.

(a) Example:

- Start with pair that have largest moment-weight difference.
- Place heavier blade in Column I and its paired blade in Column II.
- Continue with next largest moment-weight difference pair but alternate and place heavier blade in Column II and its paired blade in Column I.
- Third pair will have heaviest blade in Column II, etc.

Example:

Moment-weight Difference	Column I	Column II
Largest difference	Heaviest	Paired blade
Second largest difference	Paired blade	Heaviest
Third largest difference	Paired blade	Heaviest
Fourth largest difference	Heaviest	Paired blade
Fifth largest difference	Heaviest	Paired blade

(b) Example:

- Start with pair that have largest moment-weight difference.
- Place heavier blade in Column I and its paired blade in Column II.
- Select as many sets of paired blades as needed to make the sum of their differences equal to the difference of the first set of blades.
- Place the heaviest blade(s) in Column II.
- Continue in a like manner starting with the next pair of blades having the next largest moment weight difference.

(5) Starting at top of Column I, number each blade in consecutive order downward 1 through 36. Number blades in column II starting at top downward 37 through 72.

NOTE

Traceability number consists of four letters and three numbers.

(6) Record traceability number located underneath pressure side platform of each 2nd stage blade by installed position on AFTO 44 Addendum form. A copy of completed form is to be filed with AFTO 44 records for module.

c. Cut and remove lockwire used to hold blade retaining plate in position.

d. Verify that retaining plate is seated on 2nd stage disk by trying to insert 0.002 inch feeler gage between retaining plate and 2nd stage disk fir trees at location next to alignment pin per figure 18A. Do not measure between fir trees. If gage cannot be inserted, retaining plate is properly seated.

e. Ensure blade retaining plate dampers move freely and are inward to eliminate interference with 2nd stage blades. Blades installed onto dampers may fracture dampers.

CAUTION

Installation of wrong configuration blades may result in engine damage.

f. Ensure PN for 2nd stage blades being installed are verified as F100-PW-229. Refer to T.O. 2J-F100-54.

g. Ensure cooling passages in blades are free of foreign material and install No. 1 blade leading edge (thicker edge) down into No. 1 slot located between X marks on rear face of 2nd stage disk(2). Proceeding in clockwise direction, install remaining blades one at a time in numerical sequence.

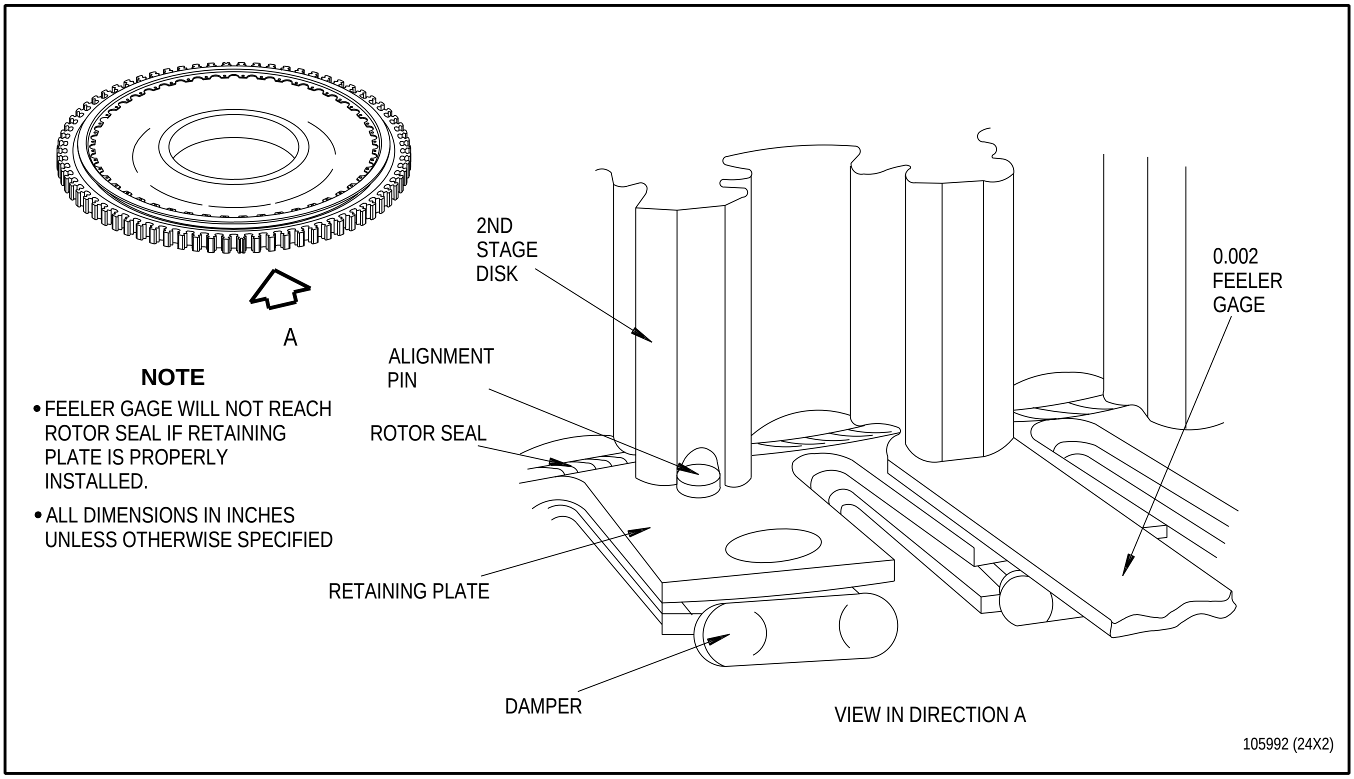


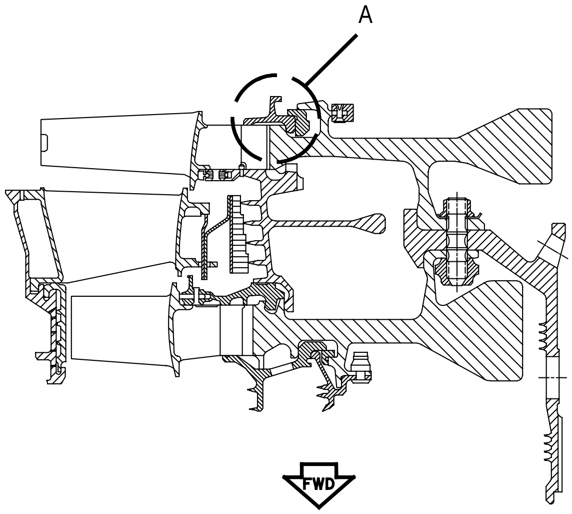
Figure 18A. Second Stage Turbine Blade Retaining Plate Assembly - Seating Check

12. SECOND STAGE REAR TURBINE BLADE RETAINING PLATE AND TURBINE BLADE RETAINING PLATE RING - INSTALLATION.
(See Figures 19 through 21.)

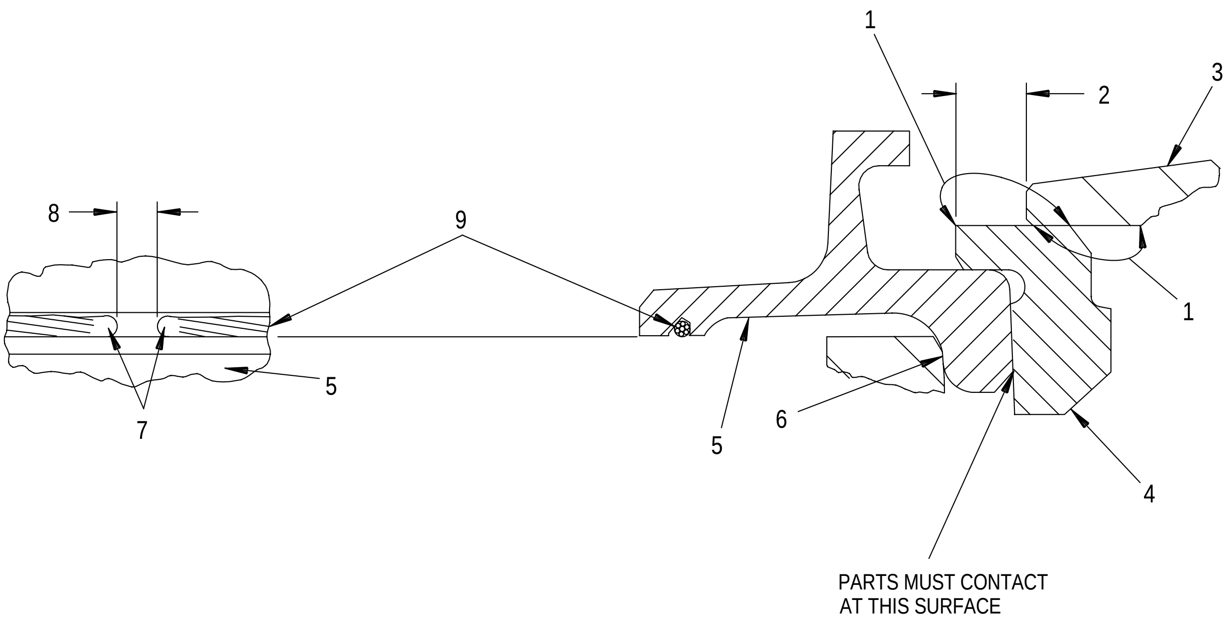
a. Install 2nd stage rear turbine blade retaining plate(5, figure 19) and turbine blade retaining plate ring(4) as follows:

(1) Install second stage turbine rotor seal(9) into groove of retaining plate(5), using hand-softened beeswax or Permabond 910 adhesive to maintain position of seal ends and end gap measurement(8).

(2) Chill second stage turbine blade rear retaining plate(5) in freezer for 10 minutes.



NOTE
ALL DIMENSIONS IN INCHES



1. COAT SURFACES WITH LUBRICATING OIL
2. 0.125 MINIMUM
3. SECOND STAGE TURBINE DISK RETAINING RING FLANGE
4. TURBINE BLADE RETAINING PLATE RING
5. SECOND STAGE TURBINE BLADE REAR RETAINING PLATE
6. SECOND STAGE TURBINE DISK SNAP DIAMETER
7. SEAL ENDS COLOR CODED GREEN
8. 0.000 TO 0.200
9. SECOND STAGE TURBINE ROTOR SEAL

12914 (48X2)

Figure 19. Turbine Blade Retaining Plate Ring, Second Stage Turbine Blade Rear Retaining Plate, and Second Stage Turbine Rotor Seal

(3) Lightly coat outer face of ring(1 and 4) and inner surface of 2nd stage turbine disk retaining ring flange(1 and 3) with lubricating oil.

(4) Install ring(4) into disk retaining ring flange(3) large flat face up and compress ring with six PWA 57830 detail-111 ring compressors.

(5) Install first ring compressor opposite ring gap and work towards ring gap installing remaining ring compressors.

(6) Ensure retaining cam for each ring compressor is installed between scallops of disk.

(7) Torque ring compressor cams fingertight locking retaining ring into disk flange.

(8) Thread PWA 57830 detail-103 shaft(5, figure 20) into base of stand(7).

CAUTION

Improper positioning of turbine rotor seal during retaining plate installation will decrease blade life.

NOTE

Retaining plate installation shall be performed rapidly once retaining plate is removed from freezer so that snap diameter does not lose its temperature.

(9) Remove retaining plate from freezer. Ensure mating surfaces are clean and free of foreign material. Ensure turbine rotor seal maintains proper positioning during installation of retaining plate. Position retaining plate(5, figure 19) onto disk snap diameter(6).

(10) Lower detail-96 clamp assembly(4, figure 20) onto rear flange of retaining plate(6).

(11) Lower detail-102 plate(3) onto detail-96 clamp assembly(4).

(12) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(5). Handtighten detail-9 nut(1).

(13) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(14) Work PWA 55380 pump to seat retaining plate(6) using minimum pressure of 500 psig, maximum pressure not to exceed 2500 psig. Allow assembly temperature to normalize before releasing pressure.

Legend for figure 20

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Clamp assembly
5. Threaded shaft
6. Second stage turbine blade rear retaining plate
7. PWA 57830 stand
8. Ring compressors

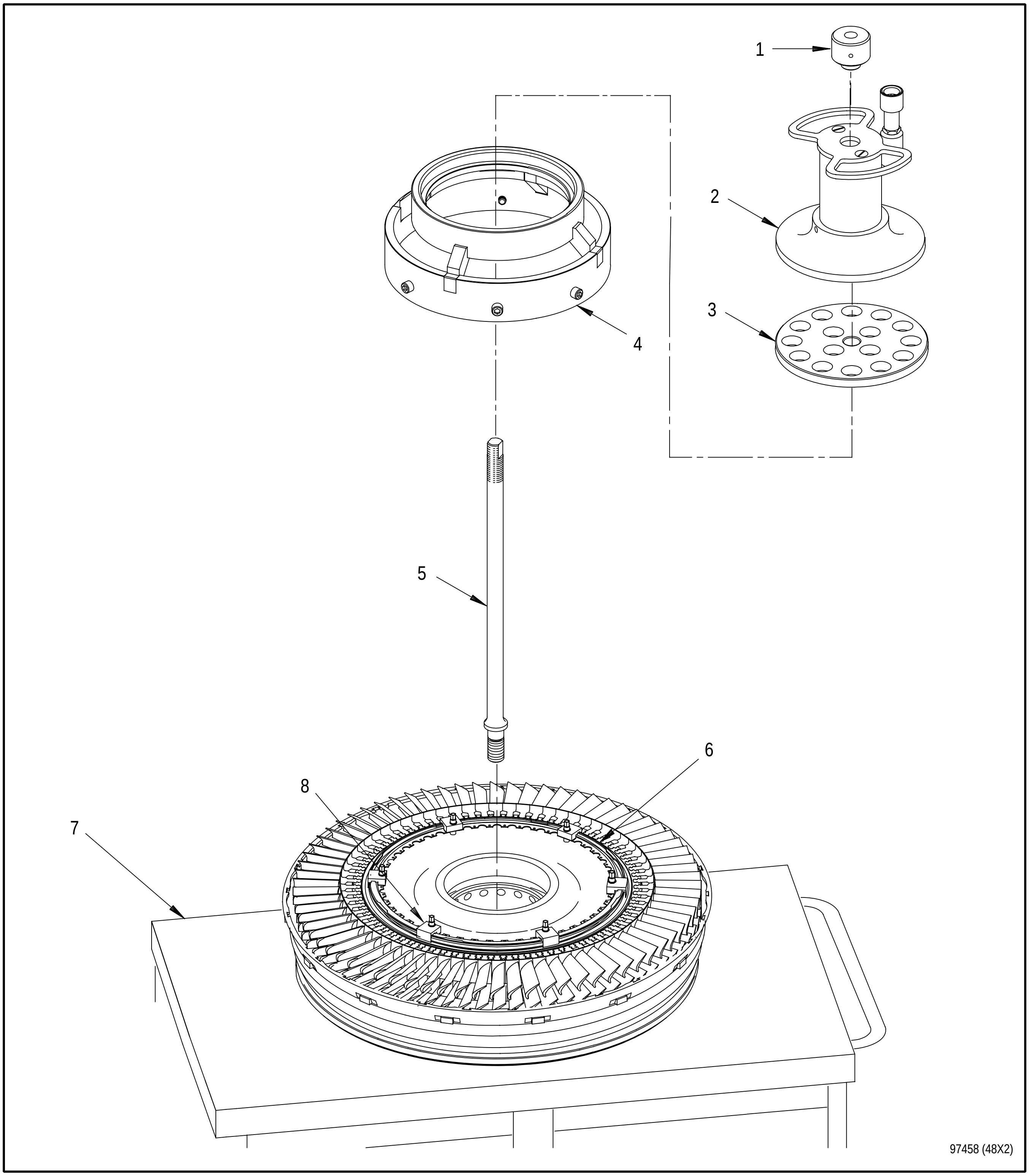


Figure 20. Second Stage Turbine Blade Rear Retaining Plate - Installation

NOTE

Retaining plate shall be depressed to remove ring compressors.

(15) Depress retaining plate(6) and remove six PWA 57830 detail-111 ring compressors(8).

(16) Pry ends of retaining ring outward to seat retaining ring using PWA 53778 pliers or equivalent. If necessary, tap detail-4 clamp assembly(4) with a plastic mallet while expanding ring to ensure ring is seated.

(17) Release pressure from PWA 55380 pump; then disconnect pump from hydraulic cylinder assembly(2).

(18) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), detail-96 clamp assembly(4), and detail-103 shaft(5).

(19) Verify dimension(2, figure 19) at four equally spaced locations using a locally manufactured go/no-go gage or equivalent.

(20) Remove excess lubricating oil from assembly.

b. Determine lift fixture to be used based on rear compressor drive turbine rotor and stator assembly configuration. For PN 4084517-700 assembly use PWA 57920 lift fixture (see step c.). For all other configurations use PWA 57712 adapter (see step d.).

c. Install PWA 57920 lift fixture onto rear compressor drive turbine rotor and stator assembly as follows:

(1) Loosen all knurled knobs(5, 6, and 7, figure 20A).

(2) Remove ball lock pin(2).

(3) Rotate clamp ring(1) fully clockwise.

CAUTION

Failure to center lift fixture over turbine rotor and stator assembly during installation can result in damage to 2nd stage turbine blades.

NOTE

Twelve o’clock position of 1st stage turbine duct and support set is slot located between X marks on face of turbine duct and vane support rear flange.

(4) Install PWA 57920 fixture on rotor and stator assembly(8) with word TOP on base assembly(3) aligned with 12 o’clock position of rotor and stator assembly. Ensure ID of base assembly(3) does not contact 2nd stage turbine blades.

(5) Rotate clamp ring counterclockwise as necessary to prevent interference between lugs on clamp ring and lugs on second stage turbine blade retaining plate during installation.

WARNING

Failure to ensure proper installation of clamps may result in disengagement of PWA 57920 during lifting and cause serious injury to personnel.

(6) Engage eight clamps(4) into rectangular slots of turbine duct and vane support. Tighten knurled knobs(5) handtight.

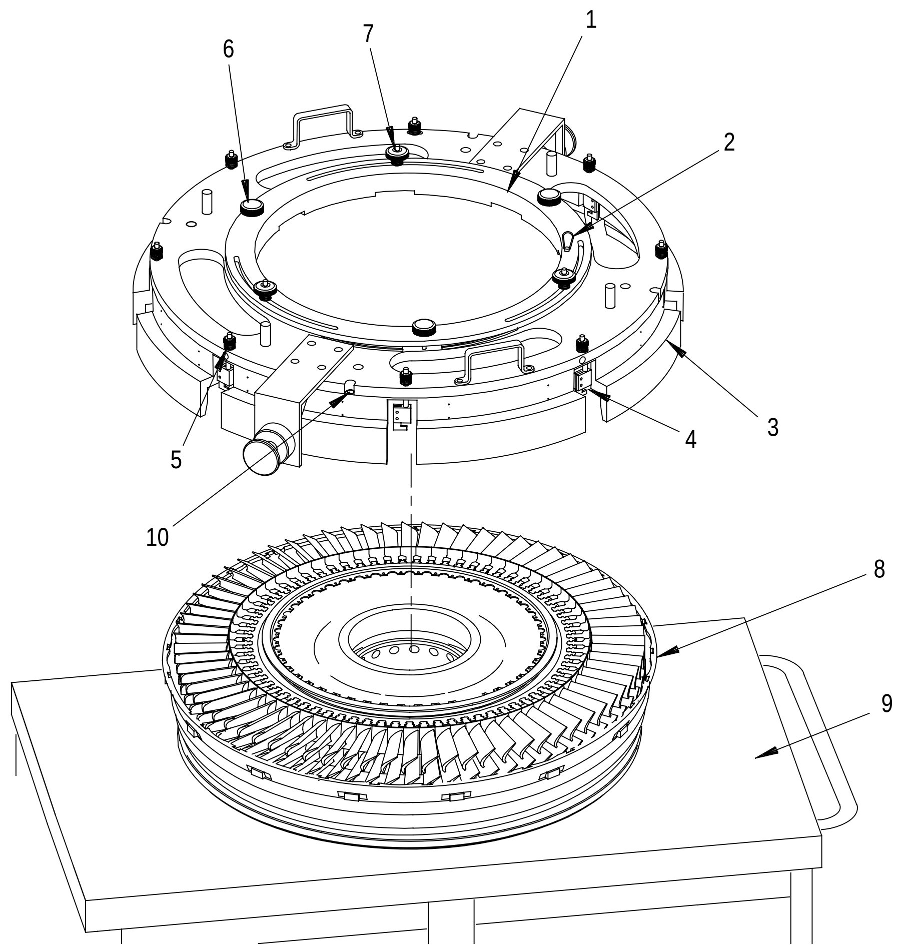
(7) Ensure all flush pins(10) are even with, or above adjacent surface of base assembly(3). If flush pins are below surface of base assembly repeat steps (1) through (6).

(8) Push clamp ring(1) down and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(9) Install ball lock pin(2) into clamp ring(1). Ring should not rotate far enough to allow disengagement of lugs on ring clamp. If disengagement of lugs occurs repeat steps(1) through (9).

(10) Tighten knurled head screws(6) handtight to hold running position of rotor.

(11) Tighten knurled knobs(7) securing clamp ring(1).



1. Clamp ring
2. Ball lock pin
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled head screw
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. PWA 57830 Stand
10. Flush pin (4 places)

Figure 20A. PWA 57920 Fixture - Installation

d. Install PWA 57712 adapter onto rear compressor drive turbine rotor and stator assembly(8, figure 21) as follows:

(1) Remove PWA 57830 detail-89 ring clamp from case and duct set.

(2) Loosen all detail-14 knurled knobs(5, 6, and 7). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure scallops do not hang up on adapter.
- The 12 o’clock position of the 1st stage turbine duct and support set is the slot located between x-marks on face of rear flange.

(3) Position adapter on rotor and stator with the word TOP (marked on detail-1 base assembly) at 12 o’clock.

(4) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o’clock positions, into slots in stator assembly.

(5) Tighten detail-14 knurled knobs(5) handtight.

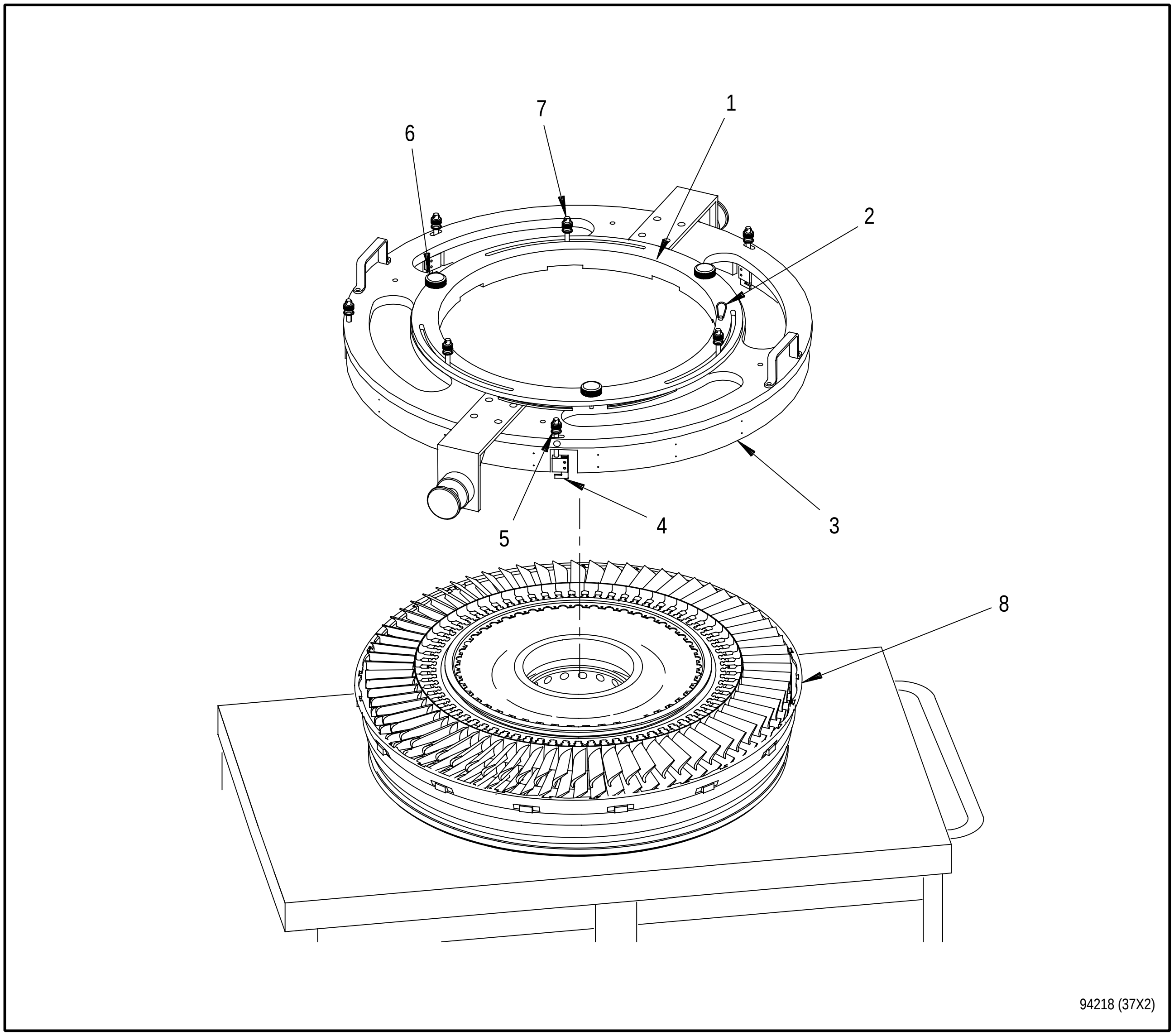
(6) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops.

(7) Install detail-20 spring plunger(2) into clamp(1). Clamp should not rotate. If clamp rotates repeat steps (6) and (7).

(8) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(9) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1 base(3).

e. Balance rear compressor drive turbine rotor and stator assembly per WP 702 00.



1. Ring clamp
2. Spring plunger
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled knob
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly

Figure 21. PWA 57712 Adapter - Installation

13. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION OF FIRST STAGE TURBINE ROTOR BLADES.
(See Figures 22 through 25A.)

a. If necessary, install rear compressor drive turbine rotor and stator assembly onto PWA 57830 stand per WP 011 00.

b. Verify that all blades have been marked with Calculated Cycles (CCY) per WP 022 00.

CAUTION

Failure to verify PNs may result in configuration mismatch and cause engine damage or failure.

b1. Verify correct engine parts to be installed. Refer to T.O. 2J-F100-54.

c. Install 1st stage turbine rotor blades(12, figure 22) as follows:

NOTE

Replacement blade sets being installed 180 degrees apart shall have same moment-weight value within 0.05 ounce-inches.

(1) Arrange blades(12) on bench in order marked at disassembly.

(2) Install a 1st stage turbine rotor blade platform seal(11) to each blade(12) with large notch of seal toward leading (thicker) edge of blade. Ensure ends of seal are located under retaining tangs on blade. Prebend platform seals to facilitate installation.

(3) Locate No. 1 blade slot on 1st stage turbine disk marked at disassembly.

Legend for figure 22

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Ring assembly
5. Turbine air seal spacer
6. First stage turbine blade front retaining plate
7. First stage turbine rotor seal
8. Threaded shaft
9. First stage turbine disk
10. PWA 57830 stand
11. First stage turbine rotor blade platform seal
12. First stage turbine rotor blade

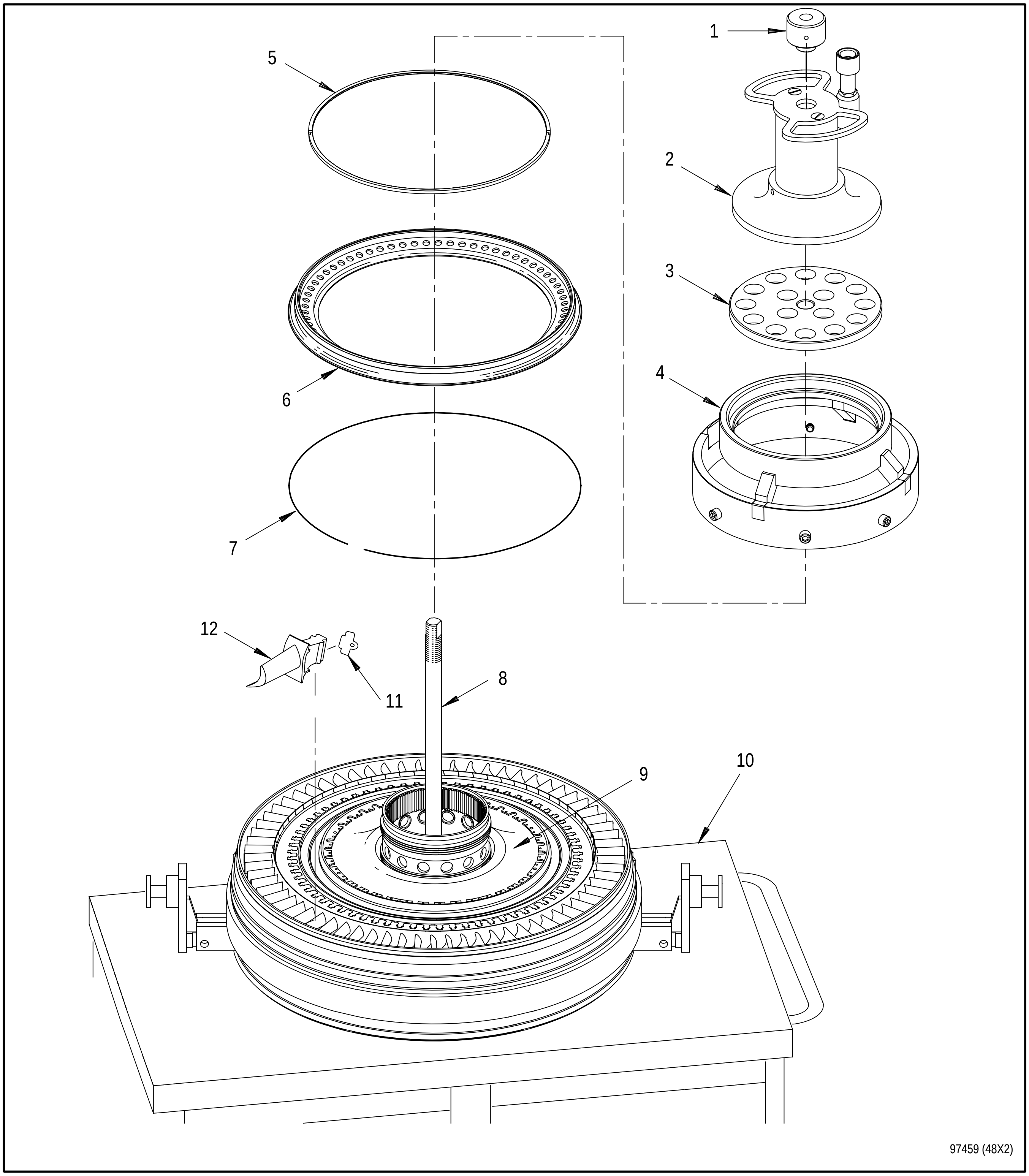


Figure 22. First Stage Turbine Blade and Front Retaining Plate - Installation

(4) Install No. 1 blade, with seal(11) installed, leading (thicker) edge up into No. 1 blade slot.

(5) Ensure seal(11) is installed on each blade before installation.

(6) Install remaining blades with leading (thicker) edge up, counterclockwise from No. 1 blade slot, and in order marked at disassembly.

d. Install 1st stage turbine rotor seal(7) and 1st stage turbine blade front retaining plate(6) as follows:

(1) Position PWA 57403 heater on retaining plate snap diameter of 1st stage disk(9).

(2) Connect heater to PWA 61685 control and heat snap diameter at 200° to 225°F (93° to 107°C) for 20 minutes.

(3) Install rotor seal (white coded ends)(7) into groove of retaining plate(6). Ensure seal end gap(2, figure 23) is 0.000 to 0.200 inch. Hold seal in place with beeswax or Permabond 910 adhesive.

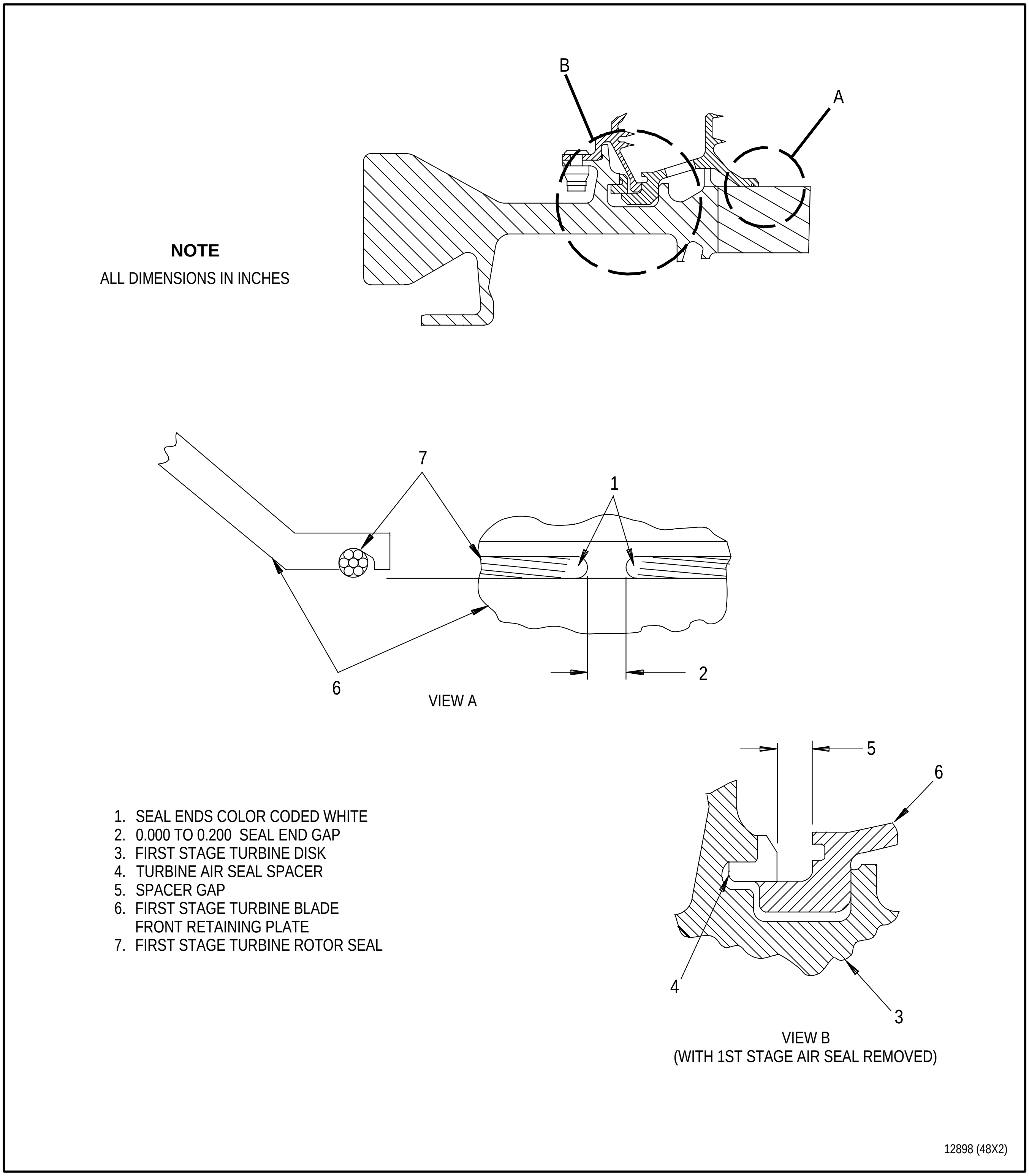


Figure 23. First Stage Turbine Rotor Seal, Blade Retaining Plate and Air Seal Spacer - Installation

NOTE

Retaining plate installation shall be performed rapidly once heater is removed so snap diameter does not lose its heat.

(4) Remove heater from 1st stage disk, ensure mating surfaces are clean and free of foreign material.

(5) Ensure white coded ends of rotor seal(7, figure 22) are located over a blade slot in disk(9), and rotor seal is properly installed in seal groove of retaining plate(6).

(6) Lower retaining plate(6), with rotor seal(7) in place onto disk(9).

(7) Lower turbine air seal spacer(5) onto 1st stage disk(9). Position spacer on disk so it will not interfere with tool details used to seat retaining plate.

(8) Install PWA 57830 detail-103 shaft(8) into base of stand(10).

(9) Lower detail-28 ring assembly(4) onto retaining plate(6).

(10) Lower detail-102 plate(3) onto detail-28 ring assembly(4).

(11) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(8) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(12) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(13) Work PWA 55380 pump to seat retaining plate(6) using a minimum pressure of 1000 psig, not to exceed maximum pressure of 5000 psig.

(14) With retaining plate(6) depressed, install spacer(5) using PWA 53778 pliers, or equivalent. Use LM 1009 pry bar to ensure spacer is seated.

(15) Release pressure from PWA 55380 pump.

(16) Verify spacer gap (5, figure 23) by attempting to insert PWA 57830 detail-30 plug gage into gap. If gage can be inserted, gap is acceptable.

(17) Verify that retaining plate(6) is seated on 1st stage disk fir trees using a 0.002 inch feeler gage. If gage cannot be inserted, retaining plate is properly seated.

(18) Disconnect pump from hydraulic cylinder assembly(2, figure 22).

(19) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), and detail-28 ring assembly(4).

e. Install 1st stage turbine air seal(5, figure 25) as follows:

(1) Chill air seal in freezer for one hour minimum.

(2) Remove thermocouple from PWA 57404 heater and store on bench. Position PWA 57404 heater on air seal snap diameter of 1st stage turbine disk(7). Install thermocouple in heater ensuring contact with turbine disk.

(3) Connect heater to PWA 61685 control and heat snap diameter at 340° to 350°F (171° to 177°C) for 20 minutes.

NOTE

First stage air seal installation shall be performed rapidly once heater is removed.

(4) Remove heater, ensure mating surfaces are clean and free of foreign material, and immediately install air seal(5) onto 1st stage disk(7), aligning ID flange holes. Install two 0.164 inch rivet pins or two 0.190 inch bolts, depending on configuration,into holes 180 degrees apart to ensure alignment is maintained when air seal is seated.

(5) Lower PWA 57830 detail-97 ring assembly(4) onto ID flange of air seal(5) so that notches in detail-97 ring assembly(4) are located at fasteners.

(6) Lower detail-102 plate(3) onto detail-97 ring assembly(4).

(7) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut(1) onto detail-103 shaft(8) until nut is approximately 1/2 inch from top of hydraulic cylinder assembly(2).

(8) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(9) Work PWA 55380 pump to seat air seal(5) using a minimum pressure of 500 psig, maximum pressure not to exceed 3500 psig.

(10) Allow assembly temperature to normalize before releasing hydraulic pressure.

(11) Release pressure from pump; then disconnect pump from hydraulic cylinder assembly(2).

(12) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), detail-97 ring assembly(4), and detail-103 shaft(8).

(13) Ensure that air seal ID flange and disk ID flange are in contact, prior to installing fasteners. No gap allowed at OD of air seal scallops between tabs (see figure 25A). If gap exists, remove air seal and repeat steps (1) through (12).

(14) Remove fasteners used to align air seal and disk ID flanges.

CAUTION

Failure to install correct attaching hardware will cause engine damage or failure.

NOTE

Two configurations exist. One uses 0.164 inch rivet pins with either collars or self-locking nuts. The other uses 0.190 inch bolts with self-locking nuts.

(15) For 0.190 inch bolt with self-locking nut configuration, secure air seal to 1st stage turbine disk as follows:

(a) Coat threads of bolts(10, figure 25) with MIL-L-7808 lubrication oil and install (heads up) through air seal and disk flanges.

(b) Install self-locking nuts(6B) on bolts.

CAUTION

Exceeding torque limits can cause bolt stress or fracture causing severe engine damage.

(c) Torque bolts 48 to 50 pound-inches.

NOTE

- Rivet pins(10, figure 25) may be secured using either pre-sheared collars(6) or self-locking nuts(6A).
- Crowfoot wrench NSN 5120-01-348-7323 (Snap On 5/16 inch Flank Drive crowfoot PN TMRX10) can be used without alteration for installation of rivet pins and nuts.

(16) For 0.164 inch rivet pin with collar or self-locking nut configuration, secure air seal to 1st stage disk as follows:

(a) Verify correct rivet pins are used by checking for two wrenching flats on pin heads. If heads do not have wrench flats, replace with proper parts.

(b) If using collars, pre-shear heads from collars using standard wrenches on two collar wrench flats.

(c) Install rivet pins (heads up) through air seal and disk flanges.

(d) Install pre-sheared collars or self-locking nuts on rivet pins. Verify run-on torque is between 1.5 and 7.0 pound-inches using standard torque wrench on collar or nut while holding rivet pin stationary using flats on rivet pin head. Discard collar or nut if run-on torque is not within 1.5 to 7.0 pound-inch limit.

CAUTION

Exceeding torque limits can cause rivet pin fracture and severe engine damage.

(e) Apply final torque 23 to 27 pound-inches to collars or nuts.

(f) Check for loose assemblies. Replace if not tight.

Legend for figure 25

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Ring assembly
5. First stage turbine air seal
6. Rivet pin collar

6A. Nut (0.164 inch)

6B. Nut (0.190 inch)

7. First stage turbine disk
8. Threaded shaft
9. PWA 57765 stand
10. Bolt (0.190 inch)

10A. Rivet pin (0.164 inch)

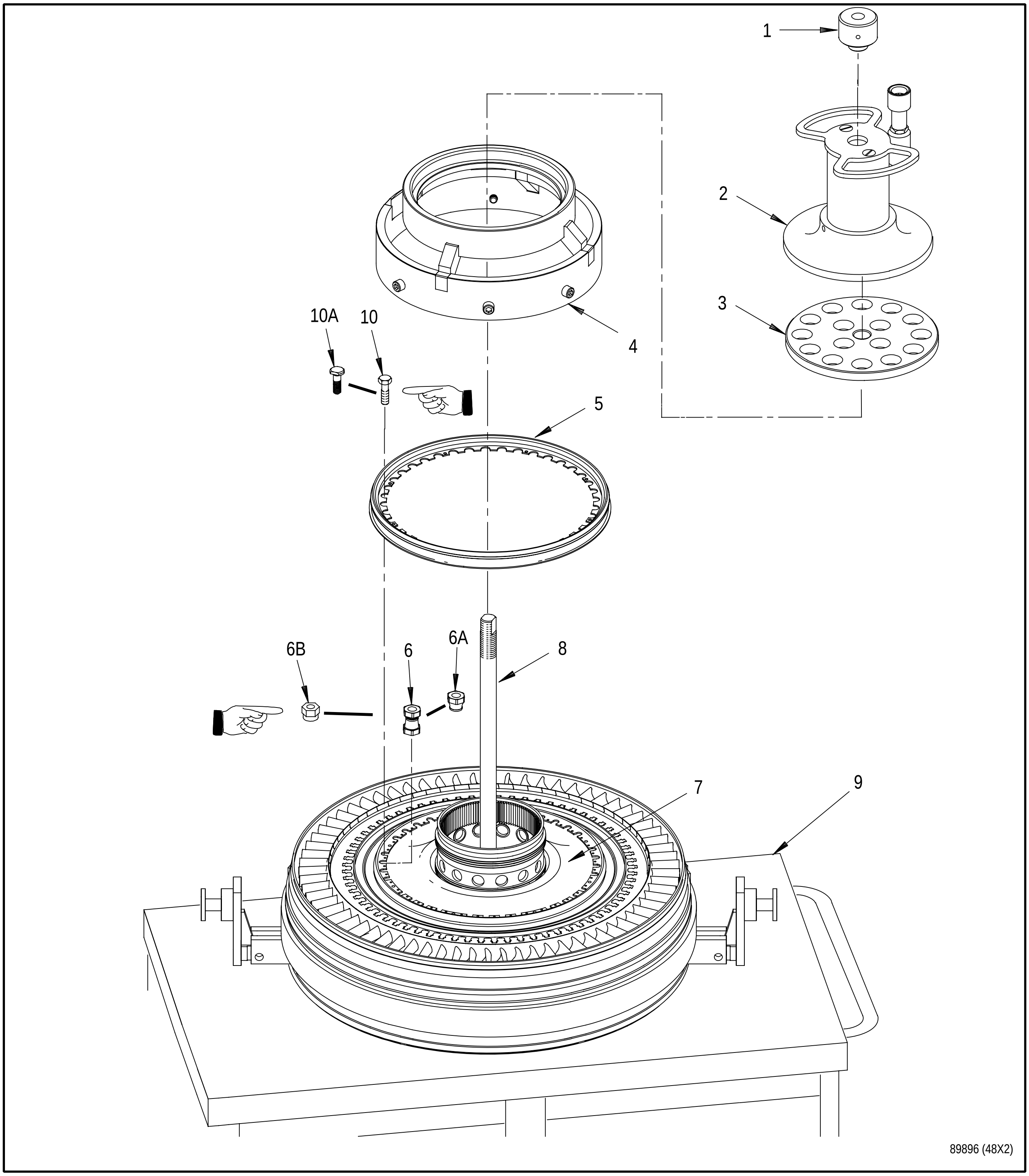


Figure 25. First Stage Turbine Air Seal - Installation

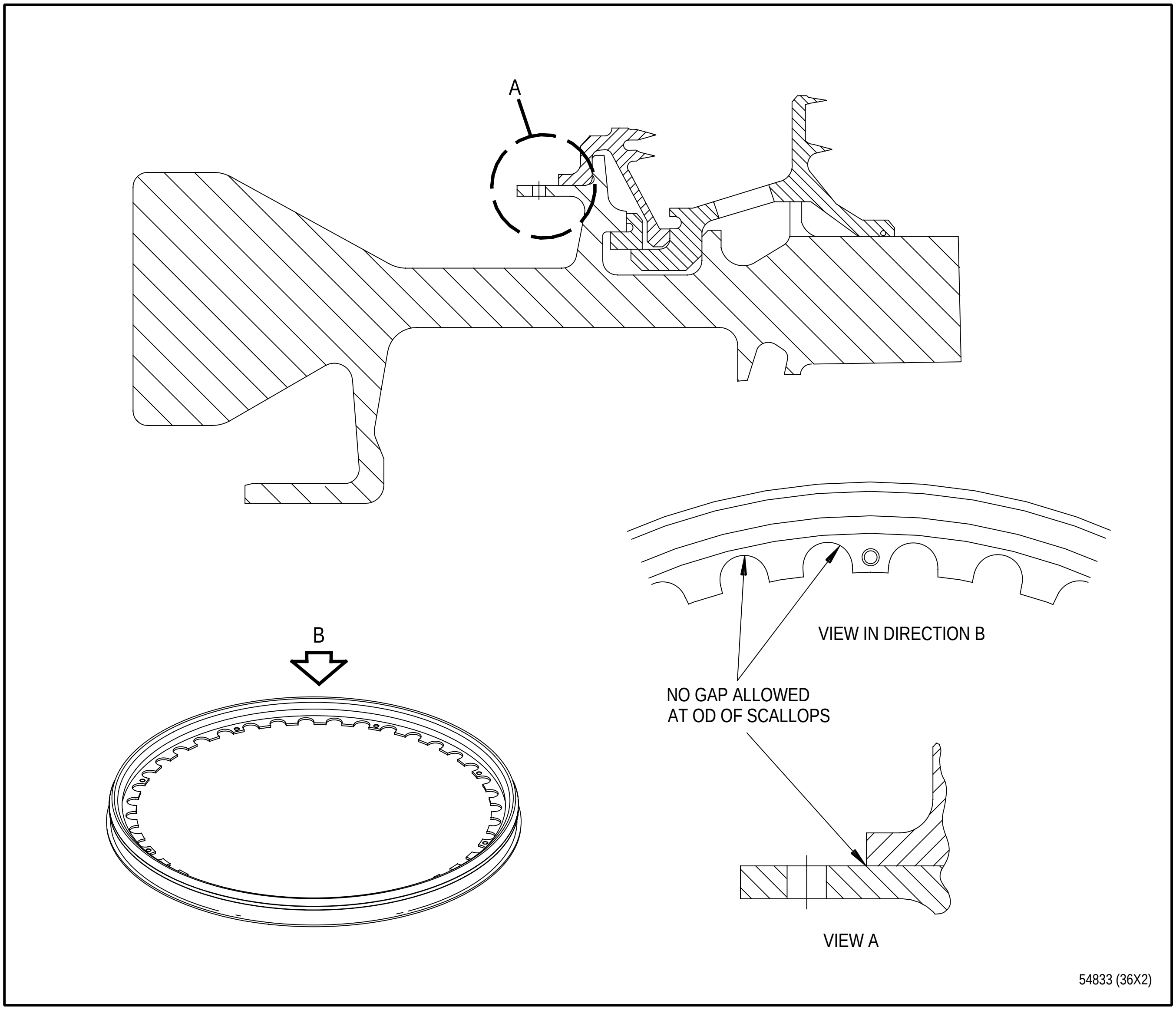


Figure 25A. Rear Compressor Drive Turbine - Air Seal Seating Check

14. REAR COMPRESSOR DRIVE TURBINE ROTOR AND STATOR ASSEMBLY - INSTALLATION OF SECOND STAGE TURBINE ROTOR BLADES.

(See Figures 26 through 29.)

a. If necessary, install rear compressor drive turbine rotor and stator assembly onto PWA 57830 stand per WP 011 00.

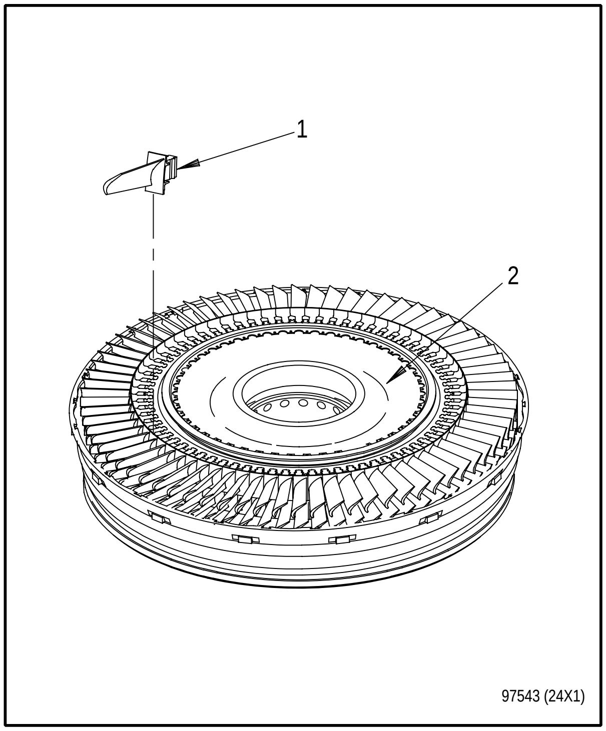
b. Verify that all blades have been marked with Calculated Cycles (CCY) per WP 022 00.

c. Install 2nd stage turbine rotor blades(1, figure 26) as follows:

NOTE

Replacement blade sets being installed 180 degrees apart shall have same moment-weight value within 0.05 ounce-inches.

(1) Arrange blades(1) on a bench in order marked at disassembly.



1. Second stage turbine rotor blade
2. Second stage turbine disk

Figure 26. Second Stage Turbine Rotor Blades - Installation

(2) Ensure blade retaining plate dampers move freely and are inward to eliminate interference with 2nd stage blades. Ensure cooling passages in blades are free of foreign material.

(3) Install No. 1 blade leading edge (thicker edge) down into No. 1 slot located between X marks on rear face of 2nd stage turbine disk(2). Install remainder of blades in numerical sequence and in clockwise direction.

d. Install 2nd stage rear turbine blade retaining plate(5, figure 27) and turbine blade retaining plate ring(4) as follows:

(1) Install second stage turbine rotor seal(9) into groove of retaining plate(5), using hand-softened beeswax or Permabond 910 adhesive to maintain position of seal ends and end gap measurement(8).

(2) Chill second stage turbine blade rear retaining plate(5) in freezer for 10 minutes.

(3) Lightly coat outer face of ring(1 and 4) and inner surface of 2nd stage turbine disk retaining ring flange(1 and 3) with lubricating oil.

(4) Install ring(4) into disk retaining ring flange(3) large flat face up and compress ring with six PWA 57830 detail-111 ring compressors. Install first ring compressor opposite ring gap and work towards ring gap installing remaining ring compressors.

(5) Ensure retaining cam for each ring compressor is installed between scallops of disk. Torque ring compressor cams fingertight, locking retaining ring into disk flange.

(6) Thread PWA 57830 detail-103 shaft(5, figure 28) into base of stand(7).

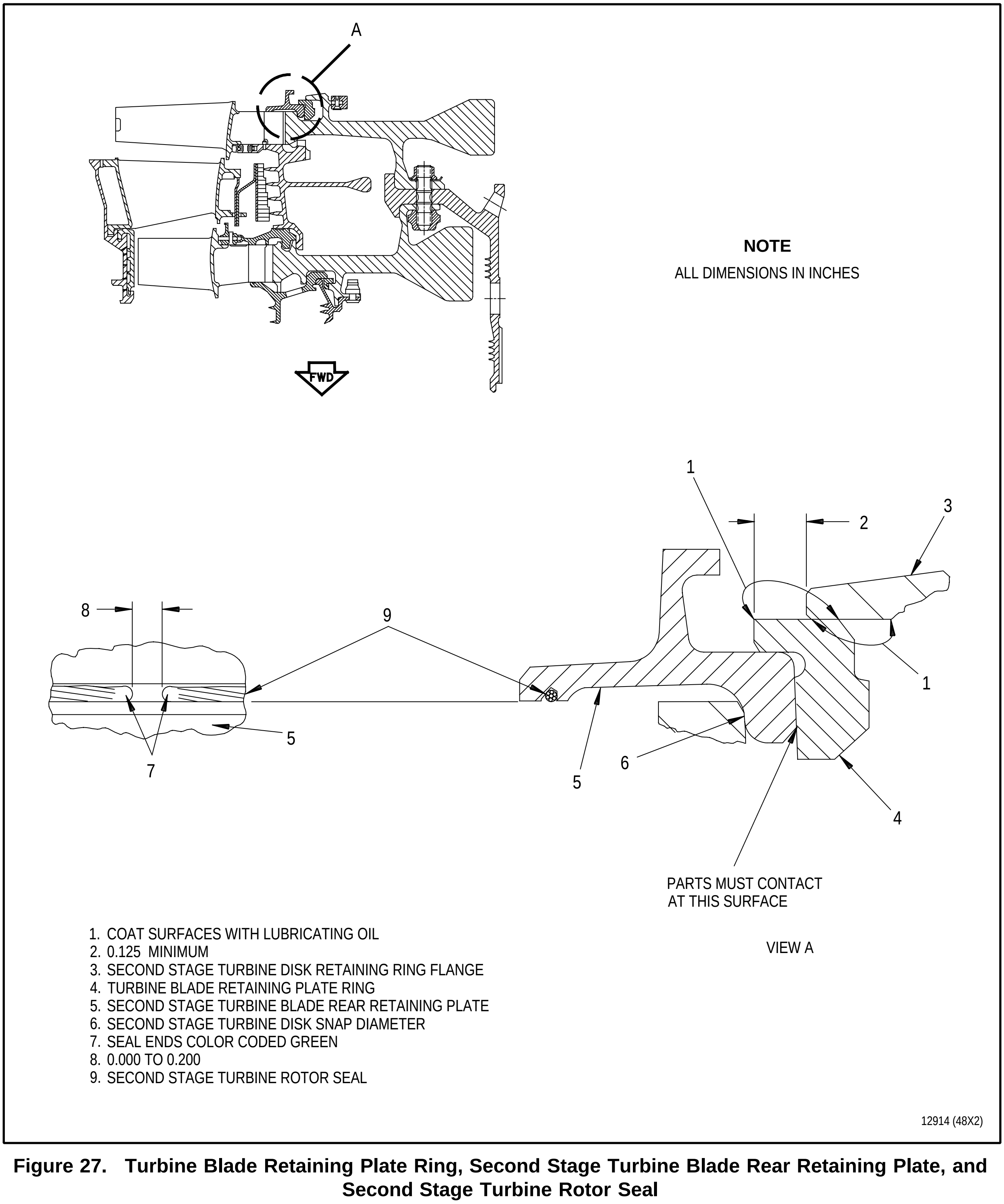


Figure 27. Turbine Blade Retaining Plate Ring, Second Stage Turbine Blade Rear Retaining Plate, and Second Stage Turbine Rotor Seal

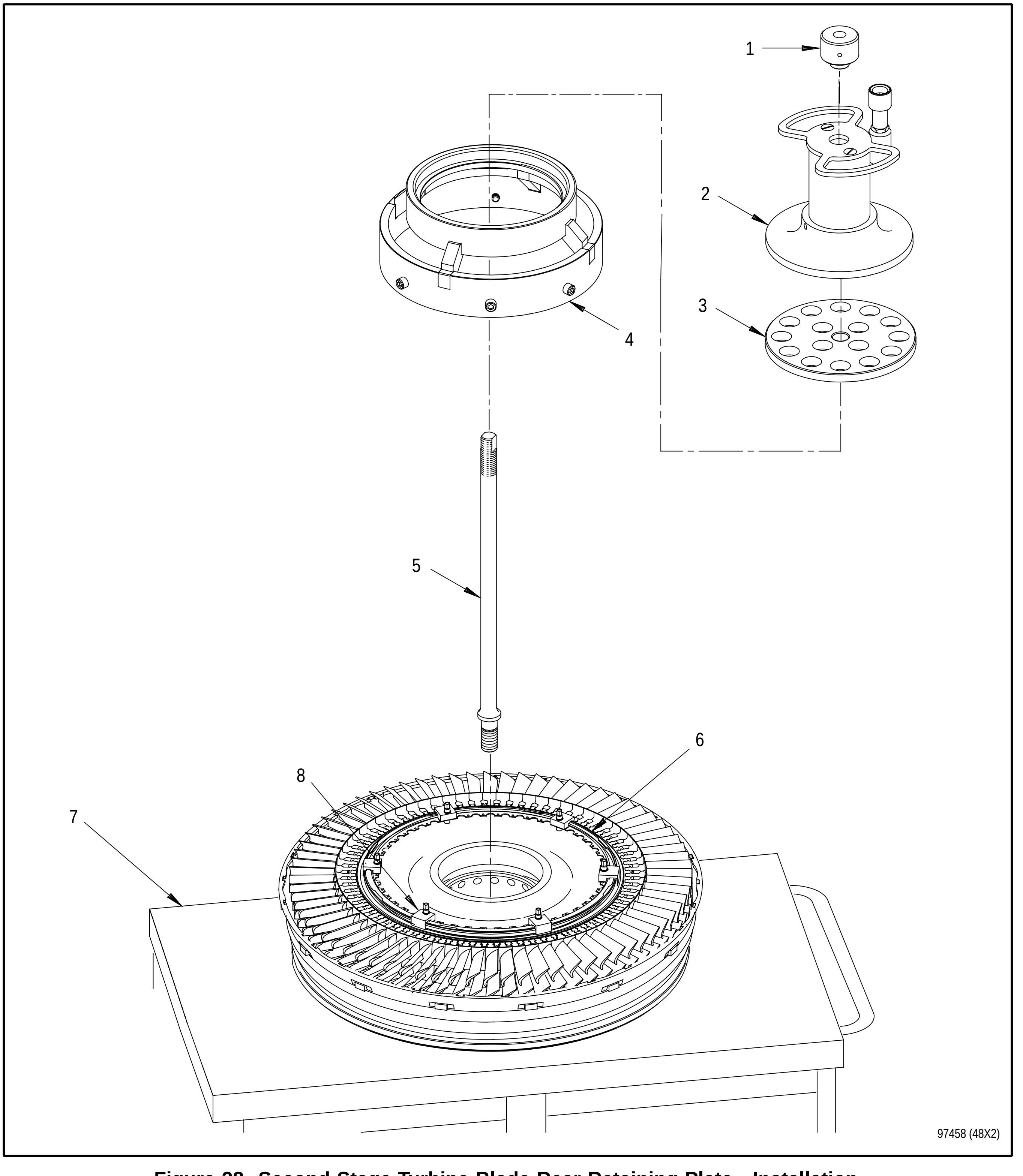


Figure 28. Second Stage Turbine Blade Rear Retaining Plate - Installation

NOTE

Retaining plate installation shall be performed rapidly once retaining plate is removed from freezer so that snap diameter does not lose its temperature.

(7) Remove retaining plate from freezer, ensure mating surfaces are clean and free of foreign material. Ensure turbine rotor seal maintains proper positioning during installation of retaining plate.

(8) Position retaining plate(5, figure 27) onto disk snap diameter(6).

(9) Lower detail-96 clamp assembly(4, figure 28) onto rear flange of retaining plate(6).

(10) Lower detail-102 plate(3) onto detail-96 clamp assembly(4).

(11) Lower hydraulic cylinder assembly(2) onto detail-102 plate(3). Thread detail-9 nut (1) onto detail-103 shaft(5). Handtighten nut(1).

(12) Connect PWA 55380 pump to hydraulic cylinder assembly(2).

(13) Work PWA 55380 pump to seat retaining plate(6) using a minimum pressure of 500 psig, maximum pressure not to exceed 2500 psig. Allow assembly temperature to normalize before releasing pressure.

NOTE

Retaining plate shall be depressed to remove ring compressors.

(14) Depress retaining plate(6) and remove PWA 57830 detail-111 ring compressors(8).

(15) Pry ends of retaining ring outward to seat retaining ring using PWA 53778 pliers or equivalent. If necessary, tap detail-4 clamp assembly(4) with a mallet while expanding ring to ensure ring is seated.

(16) Release pressure from PWA 55380 pump, disconnect pump from hydraulic cylinder assembly(2).

(17) Remove detail-9 nut(1), hydraulic cylinder assembly(2), detail-102 plate(3), detail-96 clamp assembly(4), and detail-103 shaft(5).

(18) Verify dimension(2, figure 27) at four equally spaced locations using a locally manufactured go-no go gage or equivalent.

(19) Remove excess lubricating oil from assembly.

Legend for figure 28

1. Nut
2. Hydraulic cylinder assembly
3. Plate
4. Clamp assembly
5. Threaded shaft
6. Second stage turbine blade rear retaining plate
7. PWA 57830 stand
8. Ring compressors

e. Determine lift fixture to be used based on rear compressor drive turbine rotor and stator assembly configuration. For PN 4084517-700 assembly use PWA 57920 lift fixture (see step f.). For all other configurations use PWA 57712 adapter (see step g.).

f. Install PWA 57920 lift fixture onto rear compressor drive turbine rotor and stator assembly as follows:

(1) Loosen all knurled knobs(5, 6, and 7, figure 28A).

(2) Remove ball lock pin(2).

(3) Rotate clamp ring(1) fully clockwise.

CAUTION

Failure to center lift fixture over turbine rotor and stator assembly during installation can result in damage to 2nd stage turbine blades.

NOTE

Twelve o'clock position of 1st stage turbine duct and support set is slot located between X marks on face of turbine duct and vane support rear flange.

(4) Install PWA 57920 fixture on rotor and stator assembly(8) with word TOP on base assembly(3) aligned with 12 o'clock position of rotor and stator assembly. Ensure ID of base assembly(3) does not contact 2nd stage turbine blades.

(5) Rotate clamp ring counterclockwise as necessary to prevent interference between lugs on clamp ring and lugs on second stage turbine blade retaining plate during installation.

WARNING

Failure to ensure proper installation of clamps may result in disengagement of PWA 57920 during lifting and cause serious injury to personnel.

(6) Engage eight clamps(4) into rectangular slots of turbine duct and vane support. Tighten knurled knobs(5) handtight.

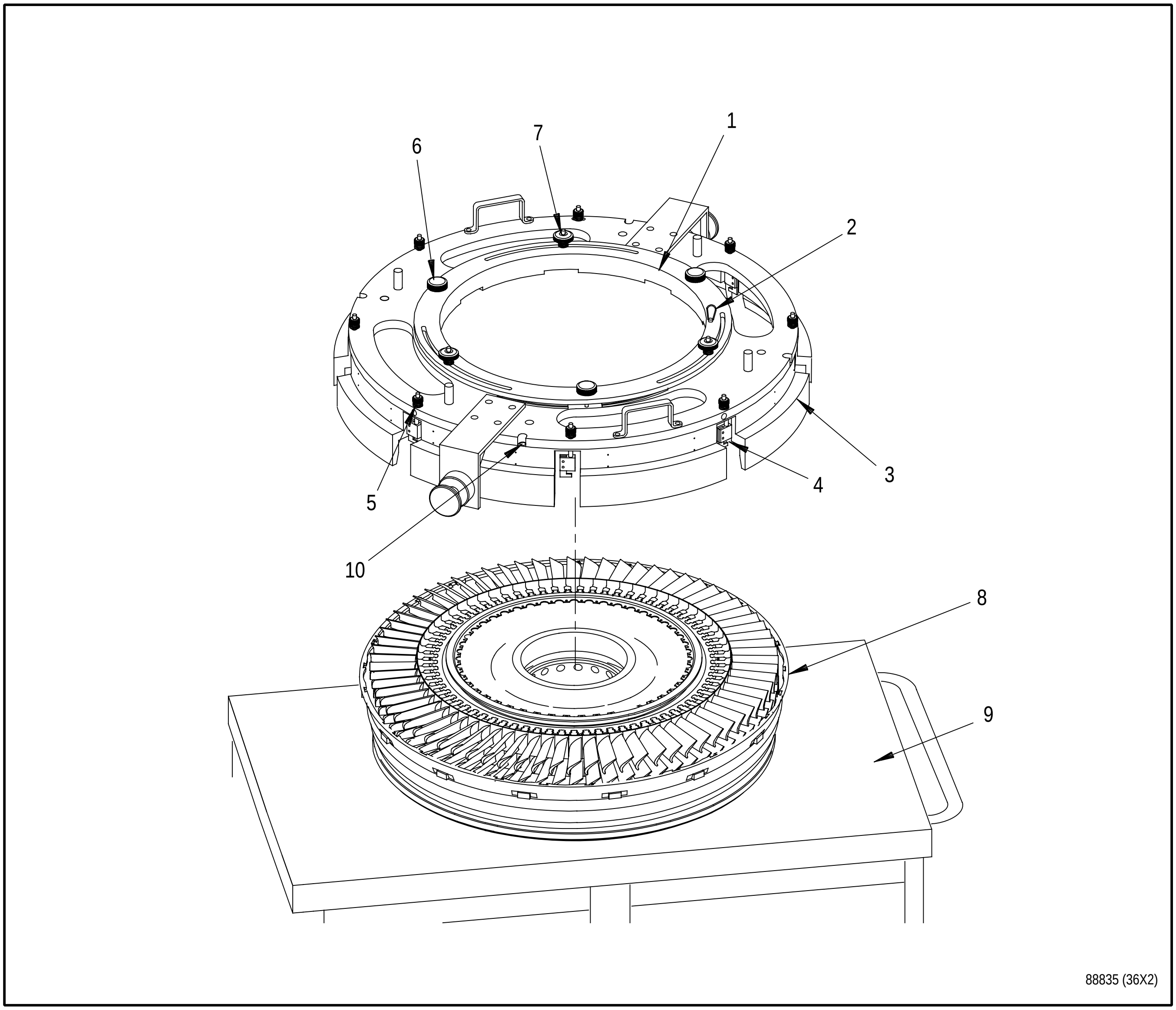
(7) Ensure all flush pins(10) are even with, or above adjacent surface of base assembly(3). If flush pins are below surface of base assembly repeat steps (1) through (6).

(8) Push clamp ring(1) down and rotate counterclockwise until it stops. Ensure lugs of ring clamp engage behind lugs of 2nd stage turbine blade rear retaining plate.

(9) Install ball lock pin(2) into clamp ring(1). Ring should not rotate far enough to allow disengagement of lugs on ring clamp. If disengagement of lugs occurs repeat steps(1) through (9).

(10) Tighten knurled head screws(6) handtight to hold running position of rotor.

(11) Tighten knurled knobs(7) securing clamp ring(1).



1. Clamp ring
2. Ball lock pin
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled head screw
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly
9. PWA 57830 Stand
10. Flush pin (4 places)

Figure 28A. PWA 57920 Fixture - Installation

g. Install PWA 57712 adapter onto rear compressor drive turbine rotor and stator assembly(8, figure 29) as follows:

(1) Loosen all detail-14 knurled knobs(5, 6, and 7). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure scallops do not hang up on adapter.
- The 12 o’clock position of the 1st stage turbine duct and support set is the slot located between x-marks on face of rear flange.

(2) Position adapter on rotor and stator with the word TOP (marked on detail-1 base assembly) at 12 o’clock.

WARNING

Engagement of clamps must be in four rectangular slots in stator assembly. Engagement in any other slots may cause adapter to disengage during lifting and cuase serious injury to personnel.

(3) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o’clock positions, into slots in stator assembly.

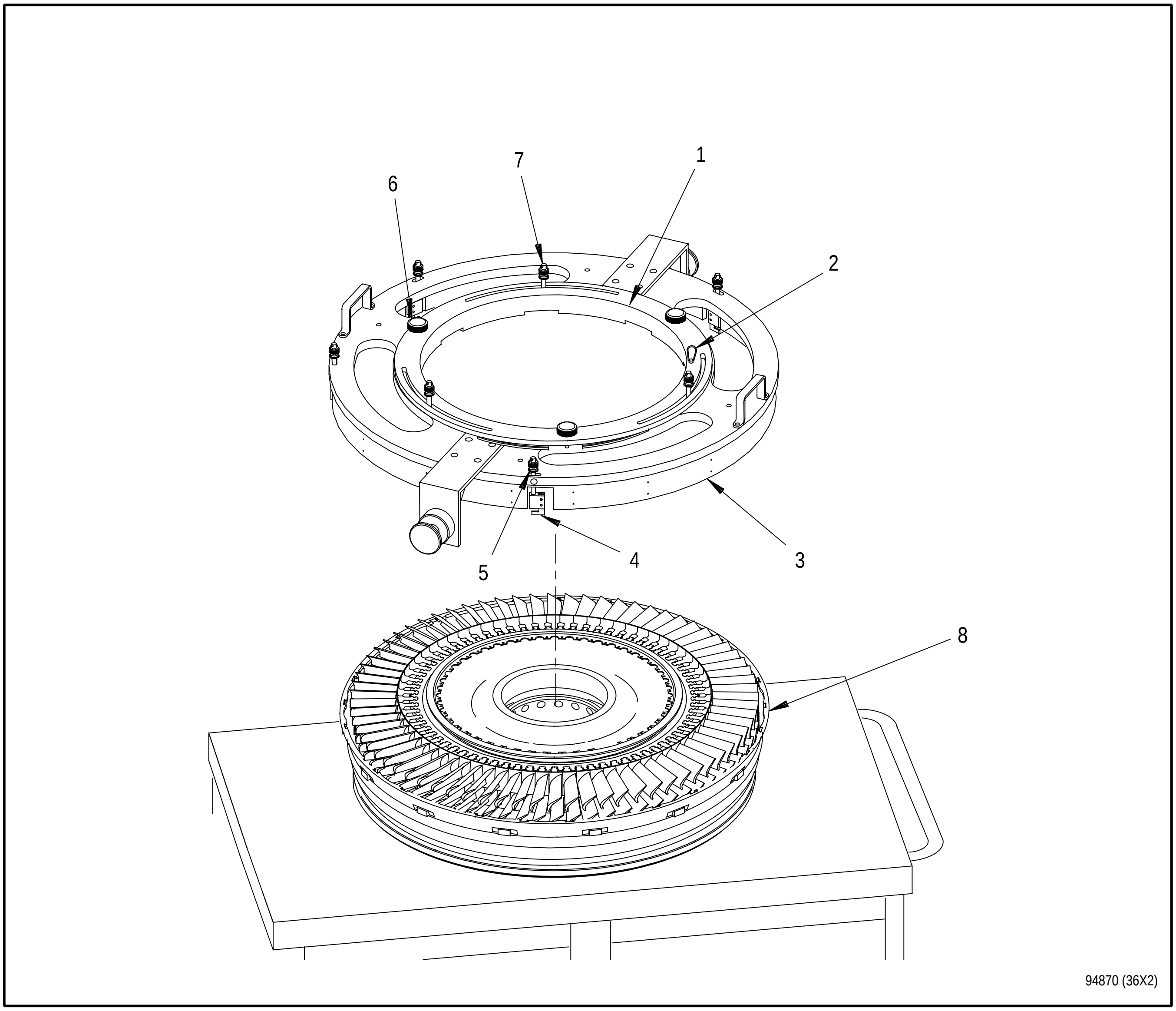
(4) Tighten detail-14 knurled knobs(5) handtight.

(5) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops.

(6) Insert detail-20 spring plunger(2) into clamp(1). Clamp should not rotate. If clamp rotates repeat steps(5) and (6).

(7) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(8) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1 base(3).



1. Ring clamp
2. Spring plunger
3. Base assembly
4. Clamp
5. Knurled knob
6. Knurled knob
7. Knurled knob
8. Rear compressor drive turbine rotor and stator assembly

Figure 29. PWA 57712 Adapter - Installation

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE -

DYNAMIC BALANCING

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 14

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1	26	6 - 7	18	11	0
2 - 3	24	8	0	12	18
4	0	9	18	13	0
5	24	10	26	14	24

REFERENCE MATERIAL REQUIRED

Title	Number
Operation and Maintenance Instructions with Illustrated Parts Breakdown - Balance Arbor	T.O. 33D4-6-513-1

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229-585	30 SEP 98	O/I	Modify PWA 57765 HPT Assembly/ Disassembly Stand by Reoperating PWA 57504-1 Crimper, F100-PW-229 Engines, F-15/F-16 Aircraft. (ECP 96QC127)

CONSUMABLE MATERIALS

Nomenclature	Specification/Vendor Part Number
Alcohol, Isopropyl	TT-I-735
Grease - Aircraft and Instrument	MIL-G-23827

EXPENDABLE ITEMS

Nomenclature	Part Number	Quantity
Counterweight turbine	4070419	As required
Rivet-tubular	4028248	As required

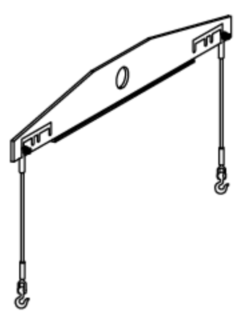
APPLICABLE SUPPORT EQUIPMENT

Paragraph	Function - Tool Nomenclature	Tool Number
2	Preparation for Dynamic Balancing	
	Sling, Handling	PWA 6580
	Adapters, Trunnion	PWA 26147
	Stand, Rear compressor turbine rotor balance build	PWA 50956
	Wrench, Rear compressor turbine rotor balance nut	PWA 57141
	Fixture, Balance high pressure turbine	PWA 57764
	Adapter	PWA 57712
3	Rear Compressor Drive Turbine - Dynamic Balance	
	Stand, Rear compressor turbine rotor balance build	PWA 50956
	Adapters, Trunnion	PWA 51225
	Weight, Calibration	PWA 57646
	Fixture, Balance high pressure turbine	PWA 57764

APPLICABLE SUPPORT EQUIPMENT

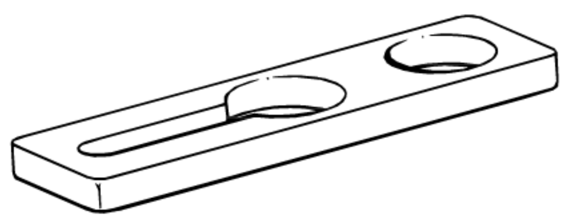
Paragraph	Function - Tool Nomenclature	Tool Number
4	Rear Compressor Drive Turbine - Removal From Balance Fixture	
	Sling, Handling	PWA 6580
	Adapters, Trunnion	PWA 26147
	Light Source	PWA 50144
	Riveter, 1st and 2nd Stage Turbine Disk Balance Counterweight Rivet	PWA 51171
	Fibrescope	PWA 56075
	Wrench, Balance Nut	PWA 57141
	Adapter, Torque Set - Install and Remove High Turbine Tiebolts (Part of PWA 57830 Stand)	PWA 57895
		or
	Adapter, Torque Set - Install and Remove High Turbine Tiebolts (Part of PWA 57765 Stand)	PWA 57504
	Fixture, Balance High Pressure Turbine	PWA 57764
	Adapter	PWA 57712

ILLUSTRATED SUPPORT EQUIPMENT



PWA 6580 –C

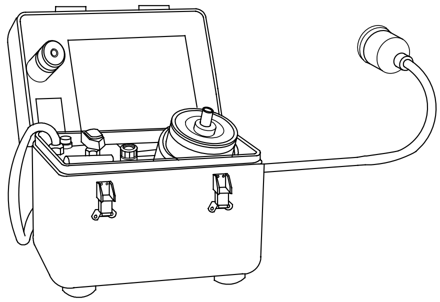
Figure T1. PWA 6580 Sling



PWA 26147 –C

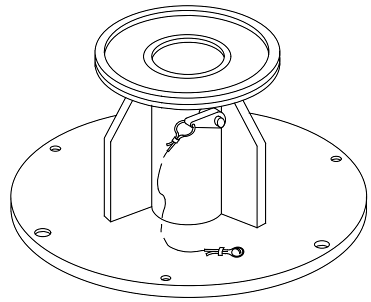
Figure T2. PWA 26147 Adapter

ILLUSTRATED SUPPORT EQUIPMENT



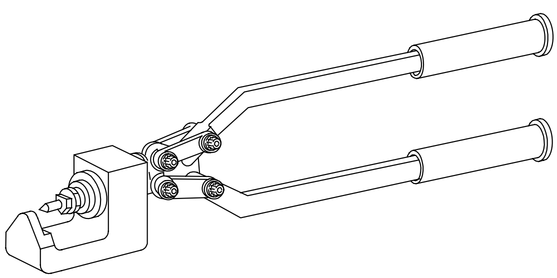
PWA 50144 –C

Figure T3. PWA 50144 Light Source



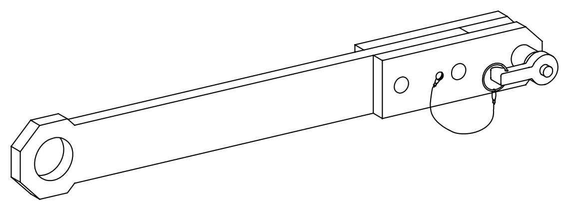
PWA 50956

Figure T4. PWA 50956 Stand



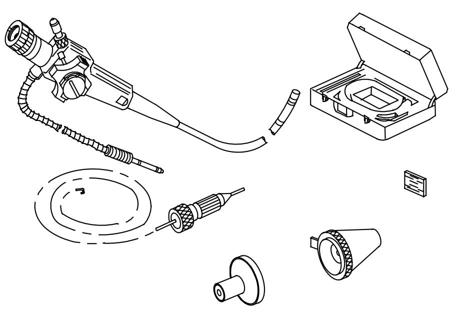
PWA 51171 –C

Figure T5. PWA 51171 Riveter



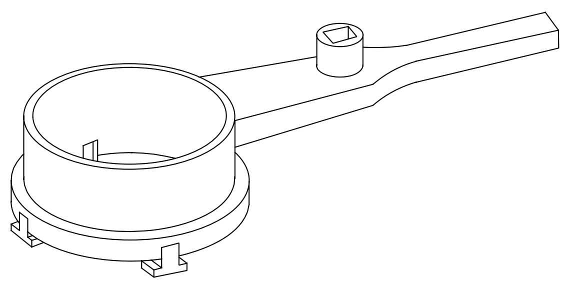
PWA 51225 –C

Figure T6. PWA 51225 Adapter



PWA 56075 –C

Figure T7. PWA 56075 Fibrescope



PWA 57141 –C

Figure T8. PWA 57141 Wrench

ILLUSTRATED SUPPORT EQUIPMENT

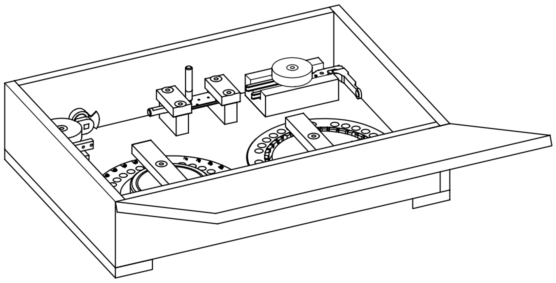


Figure T9. PWA 57504 Torque Adapter Set

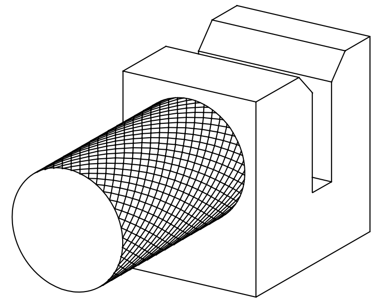


Figure T10. PWA 57646 Weight

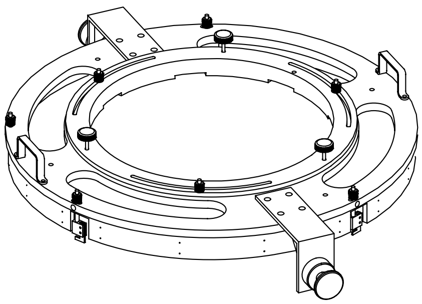


Figure T11. PWA 57712 Adapter

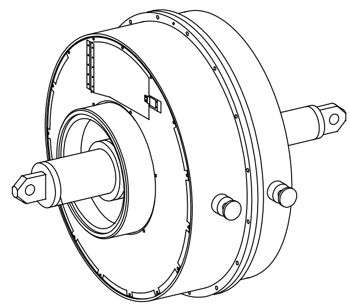


Figure T12. PWA 57764 Balance Fixture

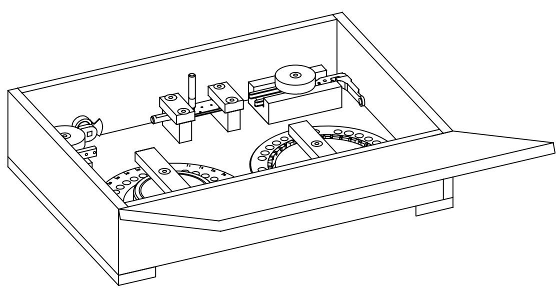


Figure T13. PWA 57895 Torque Adapter Set

1. INTRODUCTION

a. This work package contains instructions for balancing the rear compressor drive turbine rotor and stator assembly.

2. PREPARATION FOR DYNAMIC BALANCING.

(See Figures 1 and 2.)

a. Prior to using PWA 57764 balance fixture, ensure the following has been complied with:

(1) Detail-6 arbor assembly(5, figure 1) has been calibrated per method and frequency of T.O. 33D4-6-513-1.

(2) Detail-27 trim plugs(9) and details-11 and -25 calibration weights(6 and 7) shall not be tampered with following arbor calibration.

(3) Detail-7 nut and lifting eye(2), detail-26 nut and lifting eye(8), and detail-17 check master(11) shall be removed prior to balancing.

(4) Detail-1 front case assembly(3) and detail-14 lock nut(4) shall be removed from detail-6 arbor assembly(5) and detail-18 rear case assembly(10) before installing turbine onto detail-6 arbor assembly(5).

b. If necessary, install detail-18 rear case assembly(10) and detail-6 arbor assembly(5) into PWA 50956 stand as follows:

(1) Attach PWA 26147 adapters to spools of PWA 57764 balance fixture detail-18 rear case assembly(10).

(2) Attach PWA 6580 sling to PWA 26147 adapters. Using an overhead hoist, lift and position PWA 57764 balance fixture, with large OD of detail-6 arbor assembly(5) facing down, over PWA 50956 stand.

(3) Slowly lower balance fixture onto stand. Remove PWA 6580 sling and PWA 26147 adapters.

(4) Lock detail-6 arbor assembly(5) to stand using PWA 50956 stand detail-2 ball lock pin. Ball lock pin will prevent arbor from turning when tightening detail-14 lock nut(4) and detail-5 nuts(13).

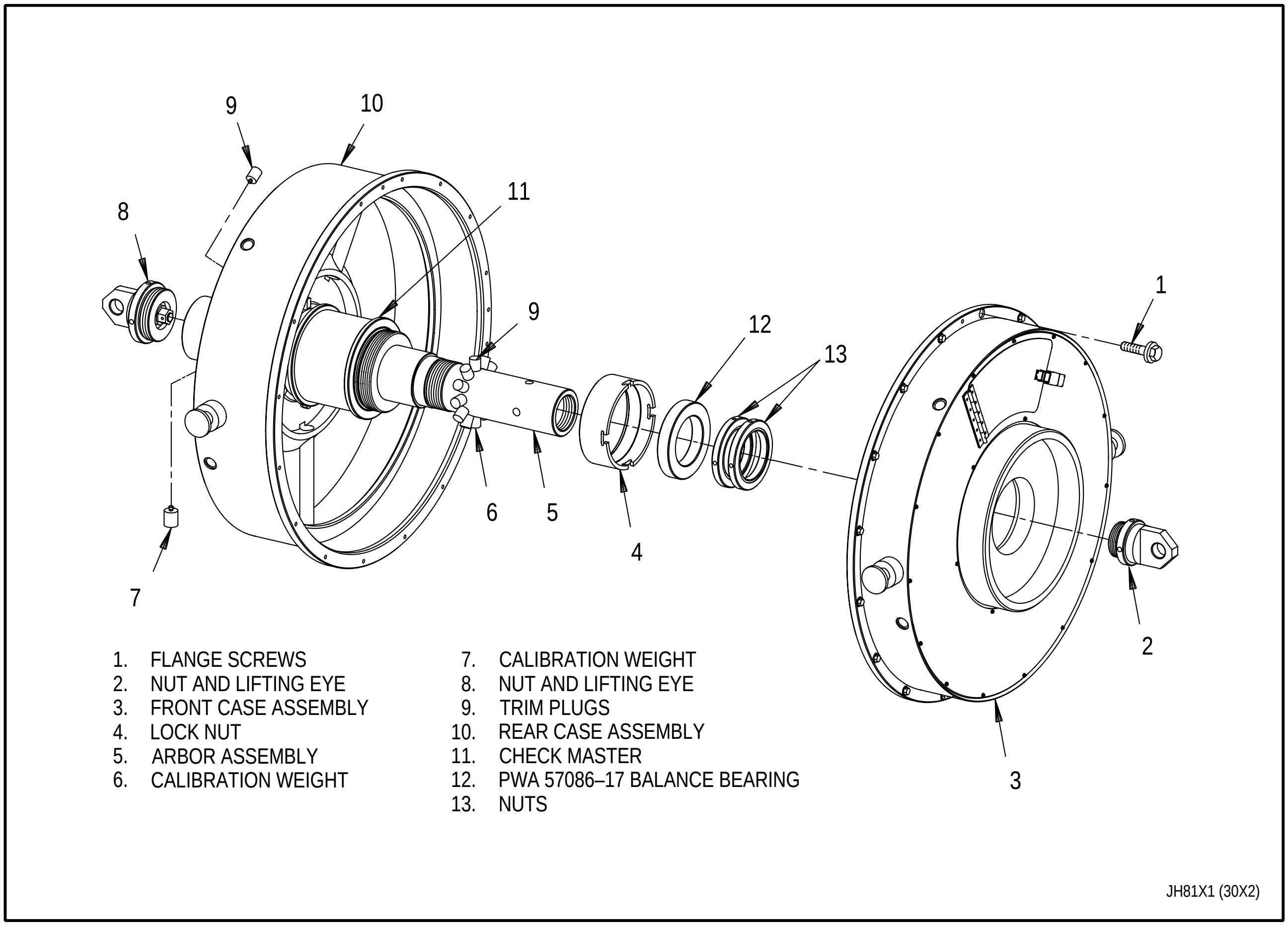


Figure 1. PWA 57764 Balance Fixture

c. Install rear compressor drive turbine onto PWA 57764 balance fixture as follows:

(1) If necessary, install PWA 57712 adapter onto rear compressor drive turbine rotor and stator assembly as follows:

(a) Loosen all detail-14 knurled knobs(5, 6, and 7, figure 2). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure scallops do not hang up on adapter.
- The 12 o’clock position of 1st stage turbine duct and support set is slot located between x-marks on face of rear flange.

(b) Position adapter on rotor and stator with the word TOP (marked on detail-1 base assembly) at 12 o’clock.

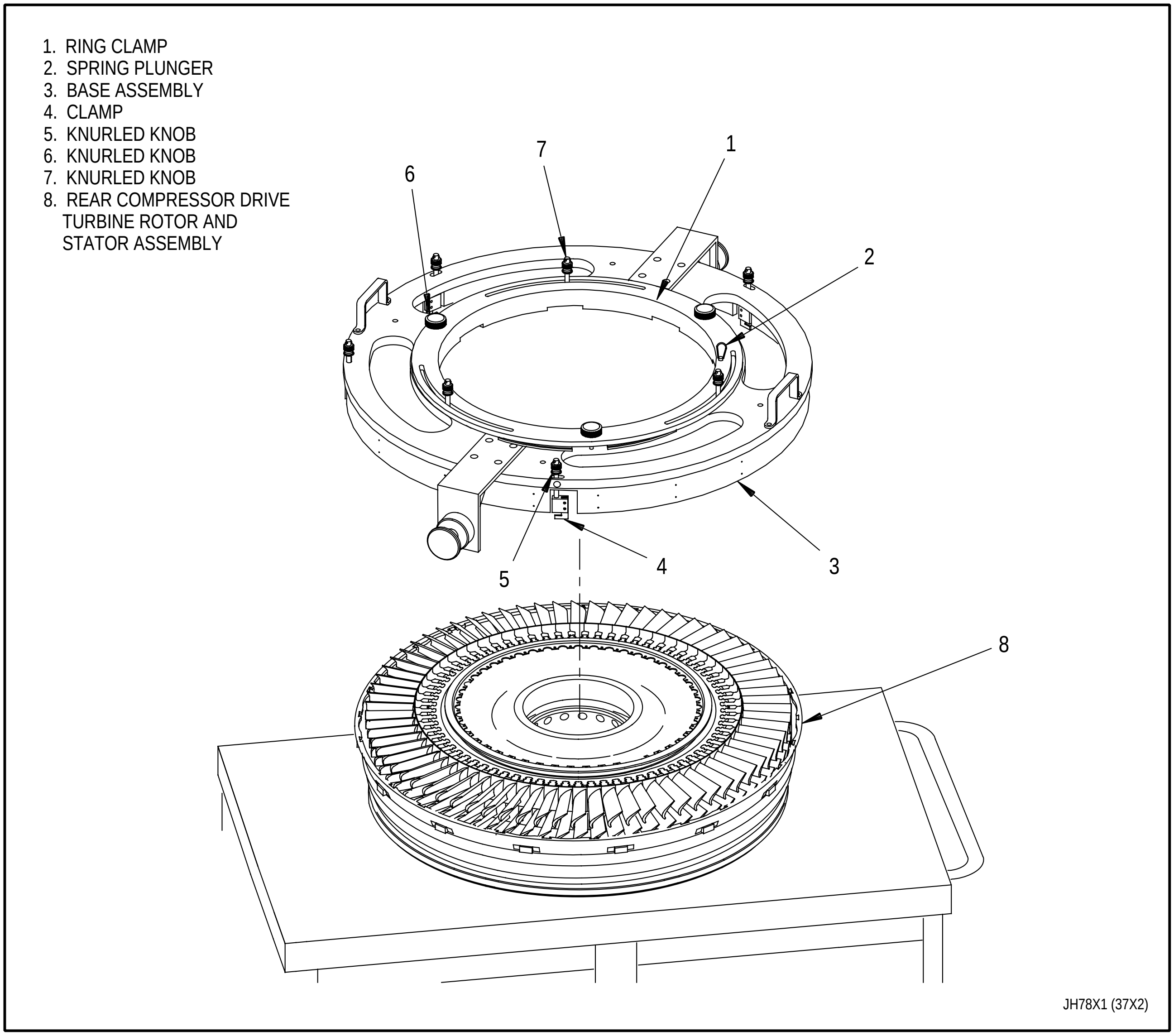


Figure 2. Installation of PWA 57712 Adapter

(c) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o'clock positions, into slots in stator assembly.

(d) Tighten detail-14 knurled knobs(5) handtight.

(e) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops.

(f) Install detail-20 spring plunger(2) into clamp(1). Clamp should not rotate. If clamp rotates repeat steps (e) and (f).

(g) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(h) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1 base(3).

(2) Attach PWA 26147 adapters to spools on PWA 57712 adapter.

(3) Attach PWA 6580 sling to PWA 26147 adapters. Using an overhead hoist, position turbine, front end down, over PWA 57764 detail-6 arbor assembly(5, figure 1), aligning zero degree index mark on turbine with zero degree index mark on detail-6 arbor assembly(5).

(4) Lower turbine so that hub bottoms on detail-6 arbor assembly(5) and duct and support set bottoms on detail-18 rear case assembly(10).

(5) Remove PWA 6580 sling, PWA 26147 adapters, and PWA 57712 adapter as follows:

(a) Ensure that all knurled knobs(5, 6, and 7, figure 2) are loose and disengage clamps(4) from stator.

(b) Remove spring plunger(2).

(c) Rotate ring clamp(1) clockwise to disengage scallops on blade retaining plate.

(d) Remove PWA 57712 adapter from turbine rotor assembly(8).

(e) Install spring plunger(2), removed in step (b), into ring clamp(1).

(6) Align zero degree index mark of rotor assembly and balance arbor; then expand chuck of detail-6 arbor assembly(5, figure 1) using a 3/8 inch hex driver. Expand chuck until light drag is felt when turning rotor.

(7) Thread detail-14 lock nut(4) onto detail-6 arbor assembly(5). Torque nut 1000 pound-inches using PWA 57141 wrench. Index detail-14 lock nut(4) to detail-6 arbor assembly(5) using Colorbrite No. 2101 silver pencil or equivalent.

(8) Torque chuck of detail-6 arbor assembly(5) to 140 to 150 pound-inches.

d. Install PWA 57764 balance fixture detail-1 front case assembly(3) as follows:

(1) Attach PWA 26147 adapters to spools of detail-1 front case assembly(3).

(2) Attach PWA 6580 sling to PWA 26147 adapters.

(3) Lower detail-1 front case assembly(3), using an overhead hoist, onto detail-18 rear case assembly(10). Align bolt and dowel pin holes and engage center portion of detail-1 front case assembly(3) with outer race of balance bearing(12). Remove sling and adapters.

(4) Tighten detail-15 flange screws(1) to secure detail-1 and -18 front and rear case assemblies(3 and 10).

3. REAR COMPRESSOR DRIVE TURBINE - DYNAMIC BALANCE.

(See Figure 3.)

a. Install PWA 57764 balance fixture and turbine into balance machine as follows:

(1) Attach two PWA 51225 adapters to overhead hoists.

(2) Using overhead hoists, transfer balance fixture and lower into balance machine.

b. Perform runout checks on 1st and 2nd stage turbine disks. Runouts shall not exceed 0.002 inch on either disk. If either runout exceeds limit, rotor shall be disassembled and reassembled to obtain proper seating of parts.

NOTE

It is permissible for knife-edges to rub honeycomb during balance operation.

c. Perform dynamic balance as follows:

NOTE

PWA 57646 calibration weight set will produce 4.0 ounce-inches of unbalance.

(1) Calibrate balance machine using PWA 57646 weights.

(2) Rotate turbine rotor at a minimum of 900 rpm.

NOTE

Initial unbalance is measured with no counterweights attached on either Plane A or Plane B.

(3) Initial unbalance shall not exceed 3 ounce-inches in each plane with turbine mounted on Surfaces C and D and Diameters E and F. (See figure 3.)

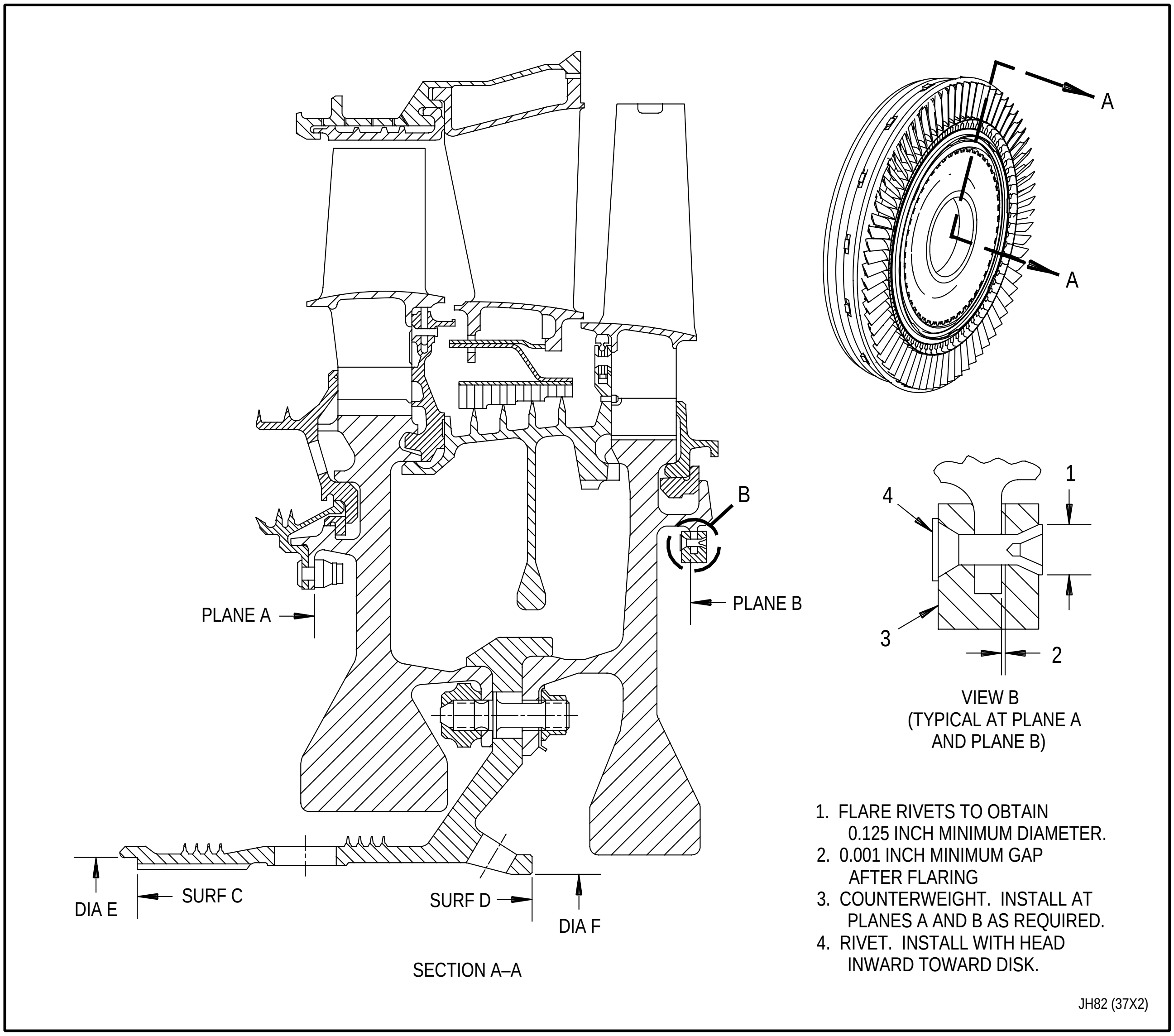


Figure 3. Rear Compressor Drive Turbine - Dynamic Balance

(4) Residual unbalance shall not exceed 0.15 ounce-inch per plane and may be corrected as follows:

(a) Add PN 4070419 counterweights as required to Planes A and B, maximum of four counterweights per Plane.

(b) Secure counterweights temporarily using PN 4028248 rivets held in with tape.

(c) Recheck balance and balance machine calibration.

d. Remove balance fixture and turbine from balance machine as follows:

(1) Attach two PWA 51225 adapters to overhead hoists, then to detail-8 front and rear lifting eyes on arbor.

(2) Using overhead hoists, lower balance fixture into PWA 50956 stand. Remove adapters.

(3) Lock detail-6 arbor assembly(5) to stand using PWA 50956 stand detail-2 ball lock pin.

4. REAR COMPRESSOR DRIVE TURBINE - REMOVAL FROM BALANCE FIXTURE.
(See figures 1 through 3.)

a. Remove PWA 57764 balance fixture detail-15 flange screws(1, figure 1).

b. Attach PWA 26147 adapters to spools of detail-1 front case assembly(3).

c. Attach PWA 6580 sling to PWA 26147 adapters. Using an overhead hoist, remove detail-1 front case assembly(3).

d. Secure counterweights to 2nd stage turbine disk rear flange as follows:

(1) Note location of counterweights and rivets taped to disk flange.

(2) Remove tape; then install counterweights and rivets at noted locations. Apply a thin coat of grease to end of rivet to hold it in place during riveting.

(3) Use PWA 51171 riveter to flare rivets to obtain minimum diameter of 0.125 inch. Gap between counterweight and counterweight flange shall be 0.001 inch minimum after flaring. (See figure 3.)

(4) Use isopropyl alcohol to clean all tape and tape residue from 2nd stage turbine disk.

e. Remove turbine from balance fixture as follows:

(1) Relieve torque from detail-14 lock nut(4, figure 1) using PWA 57141 wrench. Remove detail-14 lock nut(4).

(2) Install a 3/8 inch hex driver into small ID end of detail-6 arbor assembly(6) engaging expansion sleeve actuating screw. Relieve torque, but do not remove actuating screw. Remove hex driver.

(3) Install PWA 57712 adapter as follows:

(a) Loosen all detail-14 knurled knobs(5, 6, and 7, figure 2). Remove detail-20 spring plunger(2).

NOTE

- When installing adapter on rotor and stator assembly it may be necessary to rotate detail-2 ring clamp(1) to ensure scallops do not hang up on adapter.
- The 12 o’clock position of the 1st stage turbine duct and support set is the slot located between x-marks on face of rear flange.

(b) Position adapter on rotor and stator with the word TOP (marked on detail-1 base assembly) at 12 o’clock.

(c) Engage four detail-6 clamps(4) located at about 2, 5, 7, and 10 o’clock positions, into slots in stator assembly.

(d) Tighten detail-14 knurled knobs(5) handtight.

(e) Push detail-2 ring clamp(1) in and rotate counterclockwise until it stops.

(f) Install detail-20 spring plunger(2) into clamp(1). Clamp should not rotate. If clamp rotates repeat steps(5) and (6).

(g) Tighten detail-15 knurled knobs(6) handtight to hold running position of rotor.

(h) Tighten detail-14 knurled knobs(7) securing detail-2 ring clamp(1) to detail-1 base(3).

(4) Attach PWA 26147 adapters to spools on PWA 57712 adapter.

(5) Attach PWA 6580 sling to PWA 26147 adapters. Using an overhead hoist, remove turbine from balance fixture and position on bench rear side up.

f. Bend key washer tabs as follows:

CAUTION

Use care to avoid scratching disk which might cause disk failure. Do not use a screwdriver or similar hard-faced tool to bend key washer tabs.

(1) Bend tabs of key washers using PWA 57895-1 crimper assembly. Gap between key washer tabs and flat of nut shall not exceed 0.020 inch.

(2) Visually inspect for broken or cracked tabs using PWA 50144 light source with PWA 56075 fibrescope. Broken or cracked tabs are not acceptable.

g. Secure counterweights to 1st stage turbine disk front flange as follows:

(1) Attach PWA 26147 adapters to spools on PWA 57712 adapter.

(2) Attach PWA 6580 sling to PWA 26147 adapters. Using an overhead hoist, invert assembly front side up on bench. Remove sling and adapters.

(3) Note location of counterweights and rivets taped to disk flange. Remove tape; then install counterweights and rivets at noted locations. Apply a thin coat of grease to end of rivet to hold it in place during riveting.

(4) Use PWA 51171 riveter to flare rivets to obtain minimum diameter of 0.125 inch. Gap between counterweight and counterweight flange shall be 0.001 inch minimum after flaring (See figure 3.)

(5) Use isopropyl alcohol to clean all tape and tape residue from 1st stage turbine disk.

WORK PACKAGE

INTRODUCTION

REAR COMPRESSOR DRIVE TURBINE -

TABLE OF LIMITS AND CLEARANCE CHARTS

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 2

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	0				

1. INTRODUCTION.

This work package introduced the 800 00 and up series of work packages for the rear compressor drive turbine rotor and stator assembly. This series provides Table of Limits and Clearance Charts. The following work packages are included in this series:

WP No.	Title
801 00	Rear Compressor Drive Turbine - Table of Limits and Clearance Charts
802 00 and up	Open

WORK PACKAGE

TECHNICAL PROCEDURES

REAR COMPRESSOR DRIVE TURBINE -

TABLE OF LIMITS AND CLEARANCE CHARTS

EFFECTIVITY: ENGINE MODEL F100-PW-229

LIST OF EFFECTIVE WP PAGES

Total Number of Pages in this WP is 12

PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.	PAGE NO.	CHANGE NO.
1 - 2	23	8	2	10	21
3 - 4	0	9	19	11	2
5 - 7	23			12 Blank	0

REFERENCE MATERIAL REQUIRED

Title	Number
Introduction and General Information - - - - - - - - - - - - -	T.O. 2J-F100-53-1
Introduction to Manual Set -	WP 002 00

APPLICABLE TIME COMPLIANCE TECHNICAL ORDERS

T. O. No.	Date	Level	Title (ECP No.)
2J-F100229(II)-550	15 MAY 98	D	FINAL ASSEMBLY OF CORE MODULE FEATURING ’97 ENHANCEMENT PACKAGE, F100--PW-229 ENGINE, F-15/F-16 AIRCRAFT (ECP 96QA053)

CONSUMABLE MATERIALS

None

EXPENDABLE ITEMS

None

APPLICABLE SUPPORT EQUIPMENT

None

ILLUSTRATED SUPPORT EQUIPMENT

None

1. INTRODUCTION.

a. This work package contains dimensional limits and clearance charts for rear compressor drive turbine.

2. GENERAL INSTRUCTIONS

(See FO-1 and Tables 1 and 2.)

a. The rear compressor drive turbine dimensional limits are contained in two tables: Table 1 consists of fits and clearances between mating parts; table 2 lists blade tip radial clearances.

b. Each entry has a reference number which corresponds to a similar number on FO-1, Rear Compressor Drive Turbine Clearance Chart. The figure is used for part identification and to indicate where in the assembly the referenced limit applies.

c. Heading DIR indicates frequency and manner of inspection for adjacent reference number. Letters A, B, C, D, E, and F are used to designate inspection requirements as follows:

NOTE

The absence of a letter indicates fit is used only for manufacturing purposes, and is not required for assembly.

(1) Measurements required at depot repair, probably performed at assembly or bench assembly.

(2) Clearances that are estimated either by trial assembly or similar means. Measurements are required when feel or appearance indicates looseness or tightness which is outside specified tolerance. Measurements shall also be taken if either of parts involved is replaced and parts shall be selected to fit within tolerance specified.

(3) Estimated clearance checked at assembly. Measure suspected deviations as stated in Category B.

(4) Measurements required to provide analytical inspection on first three engines reaching each successive time. For example, operator with 300 hours shall perform this inspection on first three engines to reach 600 hours, 900 hours, and so on. Any of inspections which show excessive wear condition shall be changed to Category A.

(5) Clearances that are not subject to wear or change in normal operation and which shall be estimated during analytic inspection. Suspected change of fit requires measurement as in Category B.

(6) Clearances to be measured only at replacement of parts. Many of these fits will be machine shop measurements.

d. For a more detailed explanation of reference numbers, limits, term, symbols, and units, refer to T.O. 2J-F100-53-1, WP 002 00.

e. The Minimum and Maximum tolerances in the limits column of tables represents the value obtained by subtracting the Minimum and Maximum dimensions in the Dimensions for Reference column.

3. LIMITS.

a. Limits without a single asterisk (*) or double asterisk (**) appearing in the limits column have a Replace If Over tolerance added to either the Minimum or Maximum limit, or both.

b. Limits with a single asterisk (*) appearing in the limits column have no Replace If Over tolerance assigned.

c. Limits with a double asterisk (**) appearing in either the Minimum or Maximum limits column, or both, have been assigned a Replace If Over clearance limit identical to the respective blueprint clearance limit.

Table 1. Fits and Clearances (See FO-1.)

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3029	A	1st stage turbine air seal radial clearance			(Assembled on 1st stage turbine disk)	
		Air seal - - - - - - - - - - - - - - - - -	14.678	14.694		
		Sealing ring (front) - - - - - - - - -	14.706	14.710	.006*	.016*
		Air seal - - - - - - - - - - - - - - - - -	14.874	14.892		
		Sealing ring (center) - - - - - - - - -	14.903	14.907	.0055*	.0165*
		Air seal - - - - - - - - - - - - - - - - -	14.874	14.892		
		Sealing ring (rear) - - - - - - - - - -	14.903	14.907	.0055*	.0165*

NOTE

If grooving is present in seal lands and groove is wider than 0.070 inch, seal land runouts shall be taken in groove.

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3030	A	1st stage turbine air seal radial clearance			(Assembled on 1st stage turbine disk)	
		1st stage turbine blade retaining plate - - - - - - - - - - - - - - - - - -	17.387	17.405		
		Turbine outer air sealing ring (front) - - - - - - - - - - - - - - - - - -	17.419	17.423	.007*	.018*
		1st stage turbine blade retaining plate - - - - - - - - - - - - - - - - - -	17.491	17.509		
		Turbine outer air sealing ring (rear) - - - - - - - - - - - - - - - - -	17.519	17.523	.005*	.016*
3035		Diffuser case - - - - - - - - - - - - - -	26.092	26.100		
		Turbine duct support (18 segment) - - - - - - - - - - - - - -	26.146#	26.154#	.046T*	.062T*
		Front turbine case - - - - - - - - - - -	26.092	26.100		
		Turbine duct support (36 segment) - - - - - - - - - - - - - -	26.140#	26.148#	.040T*	.056T*

#Dimension located 0.088 inches from rear most surface of parts.

Table 1. Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3056	B	End clearance 2nd stage turbine				
		air sealing ring - - - - - - - - - -	.875	.883		
		2nd stage turbine vane - - - - - -	.884	.894	.001	.019
3057	A	Radial clearance turbine hub - -	6.680	6.684		
		Air sealing ring - - - - - - - - - - -	6.720	6.724	.018*	.022*
3111		Axial clearance duct and support set (18 segment)				
		2nd stage turbine vane - - - - - -			.012L*	.003T*
		Axial clearance duct and support set (36 segment)				
		2nd stage turbine vane - - - - - -			.011*	.006T*
3175	B	Air seal radial clearance				
		1st stage turbine ring and				
		support - - - - - - - - - - - - - - - -	19.764##	19.768##		
		1st stage turbine blade				
		assembly - - - - - - - - - - - - - - -	19.798	19.822	.015*	029*
3230		Turbine tierod - - - - - - - - - - - -	.572	.574		
		2nd stage turbine disk and				
		turbine hub assembly - - - - - -	.576	.582	.002	.010
3235		Spacer axial pinch - - - - - - - - - -			.005T*	.030T*
3256		Air seal radial clearance - - - -	6.893	6.907		
		Sealing ring - - - - - - - - - - - - - -	6.911	6.915	.002*	.011*

##Average Dimension

Table 1. Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3285		End pinch 2nd stage turbine blade retaining plate - - - - - - - - - -	2.049	2.053		
		and 1st stage turbine blade retaining plate - - - - - - - - - -	.394	.396		
		and 1st stage turbine disk - - - -	.959•	.967•		
		and 2nd stage turbine hub - - - -	.369	.371		
		and 2nd stage turbine disk - - - -	1.096•	1.104•	.001T*	.025T*
		•Flange constrained Dimension				
3287	B	2nd stage turbine air seal radial clearance 2nd stage blade retaining plate - - - - - - - - - -	17.256	17.270		
		Sealing ring (front) - - - - - - - -	17.282	17.286	.0060	.0150
		2nd stage blade retaining plate - - - - - - - - - - - - - - - -	17.356	17.370		
		Sealing ring (center front) - - -	17.382	17.386	.0060	.0150
		2nd stage blade retaining plate - - - - - - - - - - - - - - - -	17.456	17.470		
		Sealing ring (center rear) - - - -	17.482	17.486	.0060	.0150
		2nd stage blade retaining plate - - - - - - - - - - - - - - - -	17.556	17.570		
		Sealing ring (rear) - - - - - - - -	17.582	17.586	.0060	.0150

Table 1. Fits and Clearances (See FO-1.) (continued)

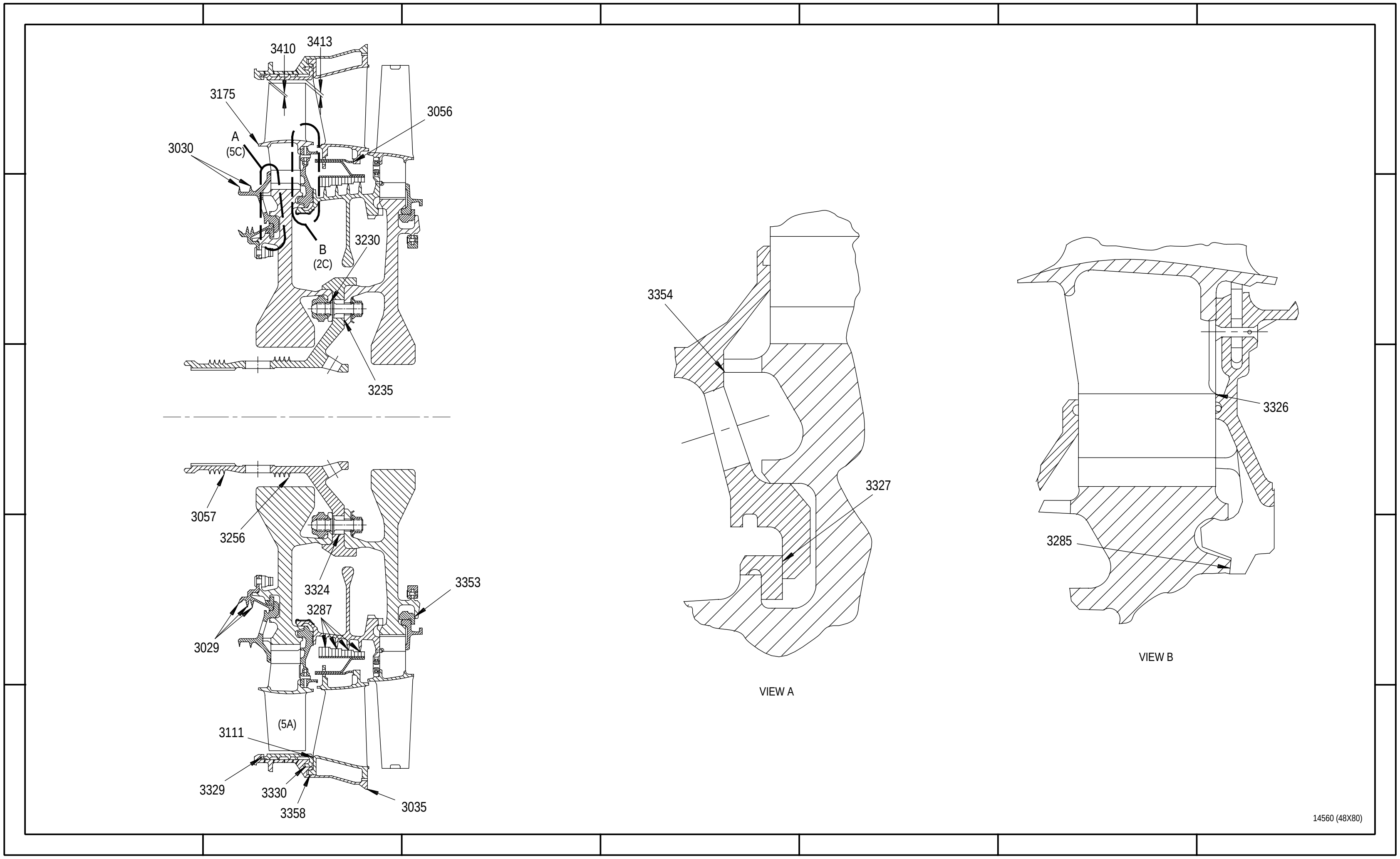
Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3324	A	Turbine hub - - - - - - - - - - - - - - -	.531	.532		
		Pin -	.5321	.5322	.0001T*	.0012T*
3326		End pinch 1st stage turbine blade retaining plate - - - - - - - - - - -	.089	.091		
		1st stage turbine disk - - - - - -	.860	.868		
		and 1st stage turbine disk - - - -	.961	.965	.002*	.016*

Table 1. Fits and Clearances (See FO-1.) (continued)

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3327		End pinch 1st stage turbine blade retaining plate - - - - - - - - - -	.072	.074		
		1st stage turbine disk - - - - - -	.040	.044		
		and 1st stage turbine disk - - - -	.120	.122	.002T*	.010T*
3329	A	1st stage turbine duct segment (18 segment) - - - - - - - - - - - -	.076	.079		
		1st stage turbine duct support - -	.077	.080	.002T*	.003*
		1st stage turbine duct segment (36 segment) - - - - - - - - - - - -	.067	.070		
		1st stage turbine duct support - -	.068	.071	.002T*	.004*
3330	A	1st stage turbine duct segment (18 segment) - - - - - - - - - - - -	.137	.142		
		1st stage turbine duct support - -	.137	.140	.003T*	.004*
		1st stage turbine duct segment (36 segment) - - - - - - - - - - - -	.136	.141		
		1st stage turbine duct support - -	.136	.139	.003T*	.005*
3353	A	PN 4069902 Turbine blade retaining plate ring and 2nd stage turbine disk - - - - - - - - - - - - - - - - -			.006*	.012*
	A	PN 4077902 Turbine blade retaining plate ring and 2nd stage turbine disk - - - - - - - - - - - - - - - - -			.008T	.019T
3354		1st stage turbine disk - Front	.264	.266		
		blade retaining plate - - - - - -	.274	.276	.008*	.012*
3358	A	1st stage turbine duct support -	.151	.154		
		2nd stage turbine stator vane - -	.143	.150	.001*	.011*

Table 2. Blade Tip Radial Clearance
(See FO-1.)

Ref No.	DIR	Name	Dimensions for Ref Min	Dimensions for Ref Max	Limits Min	Limits Max
3410		1st stage turbine rotor blade				
		1st stage turbine duct segment				
		(18 segment)				
		Top vertical centerline - - - - - - - - -			.060*	.076*
		Bottom vertical centerline - - - - - -			.064*	.080*
		1st stage turbine rotor blade				
		1st stage turbine duct segment				
		(36 segment)				
		At 18.91° CCW from TDC looking aft -			.051*	.074*
		At 198.91° CCW from TDC looking aft -			.057*	.080*
3413		1st stage turbine rotor blade				
		1st stage turbine duct segment				
		(18 segment)				
		Top vertical centerline - - - - - - - - -			.074*	.090*
		Bottom vertical centerline - - - - - -			.078*	.094*
		1st stage turbine rotor blade				
		1st stage turbine duct segment				
		(36 segment)				
		At 18.91° CCW from TDC looking aft -			.066*	.089*
		At 198.91° CCW from TDC looking aft -			.072*	.095*



FO-1. Rear Compressor Drive Turbine Clearance Chart